1988 Row Crop Weed Control Guide

This guide is based on the results of research conducted by the University of Illinois Agricultural Experiment Station, other experiment stations, and the United States Department of Agriculture (USDA). Consideration has been given to the soils, crops, and weed problems of Illinois.

The effectiveness of herbicides is influenced by rainfall, soil factors, weed spectrum, method of application, and formulation. Under certain conditions, some herbicides may damage the crop to which they are applied. In some cases, herbicide residues in the soil may damage crops that are grown later; and some herbicides may move outside the target area, affecting desirable plants.

Precautions

When selecting a herbicide, consider both the risk involved in using the herbicide and the yield losses caused by weeds. You can reduce risks by taking the following precautions:

- Apply herbicides only to those crops for which use has been approved.
- Clean tanks thoroughly when changing herbicides, especially when using a postemergence herbicide. Use a 1 percent ammonia wash to clean out traces of 2,4-D or dicamba from the tank before spraying soybeans. Some herbicide labels provide cleaning suggestions.
- Correctly calibrate the sprayer and check the nozzle output and adjustment before adding the herbicide.
- Use recommended rates. Applying too much herbicide is costly and, in addition, may damage crops and cause illegal residues. Using too little herbicide can result in poor weed control.
- Apply herbicides only at times specified on the label. Observe the recommended intervals between treatment and pasturing or harvesting of crops, as well as recommended intervals between application and subsequent planting of crops.
- Guard against drift injury to nearby susceptible plants, such as ornamentals and vegetables, as well as agronomic crops. Mist or vapors from 2,4-D and dicamba sprays may drift several hundred yards. Whenever possible, operate sprayers at low pressure with tips that deliver large droplets. Spray only on calm days or make sure that the wind is not moving toward susceptible crop plants and ornamentals. Use special precaution with Command.
- Several herbicide labels carry the following groundwater warnings under either the environmental hazard or the groundwater advisory section. "X is a chemical which can travel (seep or leach) through soil and enter groundwater which may be used as drinking water. X has been found in groundwater as a result of its use as a herbicide. Users of this product are advised not to apply X where the soils are very permeable (i.e., well-drained soils such as loamy sands) and the water table is close to the surface."
- Check the label for the proper method of container disposal. Triple rinse, puncture, and haul metal containers to an approved sanitary landfill. Haul paper containers to a sanitary landfill or burn them in an approved manner.
- Promptly return unused herbicides to a safe storage place. Store them in the original containers away from unauthorized persons, particularly children.
- Because formulations and labels are sometimes changed and government regulations modified, always refer to the most recent product label.

This guide has been developed to help you use herbicides as effectively and safely as possible. Because no guide can remove all the risk involved, however, the University of Illinois and its employees assume no responsibility for the results of using herbicides, even if they have been used according to the suggestions, recommendations, or directions of the manufacturer or any governmental agency.

Cultural and mechanical control

Good cultural practices that aid in weed control include adequate seedbed preparation, adequate fertilization, crop rotation, planting on the proper date, use of the optimum row width, and seeding at the rate required for optimal stands.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN COLLEGE OF AGRICULTURE COOPERATIVE EXTENSION SERVICE
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Planting in relatively warm soil helps crops compete better with weeds. Good weed control during the first 3 to 5 weeks is extremely important for both corn and soybeans. If weed control is adequate during that period, corn and soybeans will usually compete quite well with most of the weeds that begin growing later.

Narrow rows will shade the centers faster and help the crop compete better with the weeds. If herbicides alone cannot give adequate weed control, however, then keep rows wide enough to allow for cultivation. Some of the newer herbicides are improving the chances of achieving adequate control without cultivation.

If a preemergence or preplant herbicide does not appear to be controlling weeds adequately, use the rotary hoe while weeds are still small enough to be controlled. Use the rotary hoe after weed seeds have germinated but before most weeds have emerged. Operate it at 8 to 12 miles per hour and weight it enough to stir the soil and kill the tiny weeds. Rotary hoeing also aids crop emergence if the soil is crusted.

Row cultivators also should be used while weeds are small. Throwing soil into the row can help smother small weeds. Cultivate shallowly to prevent injury to crop roots. Herbicides can provide a convenient and economical means of early weed control and allow for delayed and faster cultivation. Furthermore, unless the soil is crusted, it may not be necessary to cultivate some fields at all if herbicides are controlling weeds adequately.

Herbicide incorporation

Soil-applied herbicides are incorporated to minimize surface loss, reduce dependence upon rainfall, and provide appropriate placement of the herbicide. Herbicides such as Sutan+ and Eradicane are incorporated soon after application to minimize surface loss from volatilization. Treflan and Sonalan are incorporated within a few hours to minimize loss due to photodecomposition and volatilization. Triazine herbicides such as atrazine and Bladex and acetamide herbicides such as Lasso and Dual may be incorporated to minimize dependence upon timely rainfall; but because these herbicides are not lost as quickly from the soil surface, the timing of incorporation is less critical. Incorporation should place the herbicide uniformly throughout the top 1 or 2 inches of soil for best control of small-seeded annual weeds that germinate at shallow depths. Slightly deeper placement may improve the control of certain weeds from deep-germinating seed under relatively dry conditions. Incorporating too deeply, however, tends to dilute the herbicide and may reduce the effectiveness. The field cultivator and tandem disk place most of the herbicide at about one-half the depth of operation. Thus for most herbicides, the suggested depth of operation is 3 to 4 inches.

Thorough incorporation with ground-driven implements requires two passes. Single-pass incorporation can result in streaked weed control, especially in moist soils. Single-pass incorporation may be adequate with some herbicides that tend to move laterally in the soil. It may also be adequate with some equipment, especially if rotary hoeing, cultivation, or subsequent herbicide treatments are used to improve weed control. If the first pass sufficiently covers the herbicide to prevent surface loss, the second pass can be delayed until immediately before planting.

The depth and thoroughness of incorporation depend upon the type of equipment used, the depth and speed of operation, the texture of the soil, and the amount of soil moisture. Field cultivators and tandem disks are commonly used for incorporation; however, disk-chisels and other combination tools are being used in some areas.

Field cultivators

Field cultivators are frequently used for herbicide incorporation. They should have three or more rows of shanks with an effective shank spacing of no more than 8 to 9 inches (a spacing of 24 to 27 inches on each of three rows). The shanks can be equipped with points or sweeps. Sweeps usually give better incorporation, especially when soil conditions are a little too wet or dry for optimum soil flow and mixing. Sweeps for "C" shank cultivators should be at least as wide as the effective shank spacing.

The recommended operating depth for the field cultivator is 3 to 4 inches. It is usually sufficient to operate the field cultivator only deep enough to remove tractor tire depressions. The ground speed should be at least 6 miles per hour. The field cultivator must be operated in a level position so that the back shanks are not operating in untreated soil, which would result in streaked weed control. Two passes are recommended to obtain uniform weed control. If single-pass incorporation is preferred, the use of wider sweeps or narrower spacing with a 3- to 5-bar harrow or rolling baskets pulled behind will increase the probability of obtaining adequate weed control.

Tandem disks

Tandem disk harrows invert the soil and usually place the herbicide deeper in the soil than most other incorporation tools. Tandem disks used for herbicide incorporation should have disk blade diameters of 20 inches or less and blade spacings of 7 to 9 inches. Larger disks are considered primary tillage tools and should not be used for incorporating herbicides. Spherical disk blades give better herbicide mixing than do conical disk blades.

Tandem disks usually place most of the herbicide in the top 50 to 60 percent of the operating depth. For most herbicides, the suggested operating depth is from 3 to 4 inches. Two passes are recommended to obtain uniform mixing with a double disk. A leveling device

(harrow or rolling baskets) should be used behind the disk to obtain proper mixing. Recommended ground speeds are usually between 4 and 6 miles per hour. The speed should be sufficient to move the soil the full width of the blade spacing. Lower speeds can result in herbicide streaking.

Combination tools

Several new tillage tools combine disk gangs, field cultivator shanks, and leveling devices. Many of these combination tools can handle large amounts of surface residue without clogging and yet leave considerable crop residue on the soil surface for erosion control. Results indicate that these combination tools may provide more uniform one-pass incorporation than does a disk or field cultivator, but one pass with them is generally no better than two passes with the disk or field cultivator.

Chemical weed control

Plan your weed-control program to fit your soils, tillage program, crops, weed problems, and farming operations. Good herbicide performance depends on the weather and on wise selection and application. Your decisions about herbicide use should be based on the nature and seriousness of your weed problems. The herbicide selectivity tables at the end of this guide indicate the susceptibility of our most common weed species to herbicides.

Corn or soybeans may occasionally be injured by some of the herbicides registered for use on those crops. To reduce injury to crops, apply the herbicide uniformly, at the time specified on the label, and at the correct rate. (See the section entitled "Herbicide rates.") Crop tolerance ratings for various herbicides are also given in the tables at the end of this guide. Unfavorable conditions such as cool, wet weather, delayed crop emergence, deep planting, seedling diseases, soil in poor physical condition, and poor-quality seed may contribute to crop stress and herbicide injury. Hybrids and varieties also vary in their tolerance to herbicides and environmental stress factors. Once injured by a herbicide, plants are prone to disease.

Crop planting intentions for next season must also be considered. Where atrazine or simazine are used, you should not plant spring-seeded small grains, small-seeded legumes and grasses, or vegetables the following year. Be sure that the application of Treflan or similar herbicides for soybeans is uniform and sufficiently early to reduce the risk of injury to wheat or corn following soybeans. Note that certain cropping restrictions apply for Command, Scepter, Classic, Preview, and Lorox Plus. Refer to the herbicide label for information about cropping sequence and appropriate intervals to allow between different crops.

Names of some herbicides

Trade	Common (generic)
AAtrex, Atrazine	atrazine
Amiben	chloramben
Banvel	dicamba
Basagran	bentazon
Bicep	metolachlor plus atrazine
Bladex	cyanazine
Blazer, Tackle	acifluorfen
Bronco	alachlor plus glyphosate
Buctril, Brominal	bromoxynil
Buctril/atrazine	bromoxynil plus atrazine
Butyrac 200, Butoxone	2,4-DB
Classic	chlorimuron
Cobra	lactofen
Colonel	paraquat plus atrazine
Command	clomazone
Commence	clomazone plus trifluralin
Conquest	cyanazine plus atrazine
Dual	metolachlor
Eradicane	EPTC plus safener
Eradicane Extra	EPTC plus safener and extender
Evik	ametryn
Extrazine	cyanazine plus atrazine
Fusilade 2000	fluazifop
Gramoxone Super	paraquat
Laddok	bentazon plus atrazine
Lasso, Arena	alachlor
Lariat	alachlor plus atrazine
Lorox, Linex	linuron
Lorox Plus	chlorimuron plus linuron
Marksman	dicamba plus atrazine
Poast	sethoxydim
Prelude	paraquat plus linuron plus metolachlor
Preview	chlorimuron plus metribuzin
Princep, Simazine, Caliber 90	simazine
Prozine	pendimethalin plus atrazine
Prowl	pendimethalin
Ramrod	propachlor
Reflex	fomesafen
Rescue	naptalam plus 2,4-DB
Roundup	glyphosate
Salute	metribuzin plus trifluralin
Scepter	imazaquin
Sencor, Lexone	metribuzin
(several)	2,4-D
Sonalan	ethalfluralin
Squadron	pendimethalin plus imazaquin
Surflan	oryzalin
Sutan+, Genate Plus	butylate plus safener
Sutazine, Rhino	butylate plus atrazine
Tandem	tridiphane
Tornado	fomesafen plus fluazifop
Treflan, Trilin	trifluralin
Turbo	metribuzin plus metolachlor
Vernam	vernolate
Whip	fenoxaprop

Some herbicides have different formulations and concentrations under the same trade name. *No endorsement of any trade name is implied, nor is discrimination against similar products intended.*

Herbicide combinations

Herbicides are often combined to control more weed species, reduce carryover, or reduce crop injury. Numerous combinations or mixtures of herbicides are being sold as premixes, while others are tank-mixed. Tank-mixing allows you to adjust the ratio of herbicides to fit local weed and soil conditions, while premixes may overcome some of the tank-mixing compatability problems. If you use a tank-mix, you must follow restrictions on all products used in the combination.

Problems sometimes occur when mixing emulsifiable concentrate (EC) formulations with wettable powder (WP), water-dispersible liquid (WDL), or water-dispersible granule (WDG) formulations. These problems can sometimes be prevented by using proper mixing procedures. Fill tanks at least one-fourth full with water or liquid fertilizer before adding herbicides that are suspended. If using liquid fertilizers, check compatibility in a small lot before mixing a tankful. The addition of compatibility agents may be necessary. Wettable powders, WDGs, or WDLs should be added to the tank and thoroughly mixed before adding ECs. Emulsify ECs by mixing with equal volumes of water before adding them to the tank. Empty and clean spray tanks often enough to prevent accumulation of material on the sides and the bottom of the tank.

The user can apply two treatments of the same herbicide (split application) or can use two different herbicides, provided such uses are registered. The use of one herbicide after another is referred to as a sequential or overlay treatment. Sequential treatment can be done in a number of ways. For example, a preplant application may be followed by a preemergence application, or a soil-applied treatment may be followed by a postemergence treatment. One herbicide may be broadcast, while the other is banded or directed.

Herbicide rates

Herbicide rates vary according to the time of application, soil conditions, the tillage system used, and the seriousness of the weed infestation. Sometimes lower rates are specified for preemergence application than for preplant incorporated application. Postemergence rates may be lower than preemergence rates if the herbicides can be applied at either time. Postemergence rates often vary depending upon the size and species of the weeds and whether or not an adjuvant is specified. Rates for combinations are usually lower than rates for herbicides used alone.

The rates for soil-applied herbicides usually vary with the texture of the soil and the amount of organic matter the soil contains. For instance, light-colored, medium-textured soils with little organic matter require relatively lower rates of most herbicides than do dark-colored, fine-textured soils with medium to high organic-matter content. For sandy soils the herbicide label may specify "do not use," "use a reduced rate," or "use a postemergence rather than soil-applied herbicide," depending on the herbicide and its adaptation and on crop tolerance.

The rates given in this guide are, unless otherwise specified, broadcast rates for the amount of formulated product. If you plan to band or direct herbicides, adjust the amount per crop acre according to the percentage of the area actually treated. Many herbicides have several formulations with different concentrations of active ingredient. Be sure to read the label and make the necessary adjustments when changing formulations.

Postemergence herbicide principles

Postemergence herbicides applied to growing weeds generally have foliar rather than soil action; however, some may have both. The rates and timing of applications are based on weed size and climatic conditions. Weeds can usually be controlled with a lower application rate when they are small and tender. Larger weeds often require a higher herbicide rate or the addition of a spray additive, especially if the weeds have developed under droughty conditions. Herbicide penetration and action are usually greater when the temperature and relative humidity are high. Rainfall occurring too soon after application (1 to 8 hours, depending on the herbicide) can cause poor weed control.

Translocated herbicides are most effective at lower spray volumes (5 to 20 gallons per acre), whereas contact herbicides require more complete coverage. Foliar coverage increases as water volume and spray pressure are increased. Spray nozzles that produce small droplets also improve coverage. For contact herbicides, 20 to 40 gallons of water per acre are often recommended for ground application and a minimum of 5 gallons per acre is recommended for aerial application. Spray pressures of 30 to 60 psi are often suggested with flat-fan or hollow-cone nozzles to produce small droplets and improve canopy penetration. These small droplets are quite subject to drift.

The use of an adjuvant such as a surfactant, crop-oil concentrate, or fertilizer solution may be recommended to improve spray coverage and herbicide uptake. These spray additives will usually improve weed control but may increase crop injury. Spray additives may be needed, especially under droughty conditions or on larger weeds.

Crop size limitations may be specified on the label to minimize crop injury and maximize weed control.

If weeds are smaller than the crop, basal-directed sprays may minimize crop injury because they place more herbicide on the weeds than on the crop. If the weeds are taller than the crop, rope-wick applicators or recirculating sprayers can be used to place the herbicide on the top of the weeds and minimize contact with the crop. Follow the label directions and precautions for each herbicide.

Conservation tillage and weed control

Conservation tillage refers to tillage methods that provide efficient crop production along with adequate control of soil erosion caused by wind and water. Erosion is controlled by protecting the soil surface with plant residue. The amount of tillage is less than that used in conventional moldboard plowing. Chisel plowing, ridge tilling, or no tillage can be used; several other systems are also available.

With reduced tillage systems, there is often a greater reliance upon herbicides for weed control. With these systems, herbicides cannot be incorporated without covering much of the residue that is necessary for effective erosion control. Early applications of preplant, preemergence, or postemergence herbicides are alternatives to incorporation.

Early preplant herbicides may be applied several weeks before planting. Early application may reduce the need for a contact herbicide at planting. However, early preplant application may require additional herbicides (preemergence or postemergence) or cultivation for satisfactory weed control.

Compared with preplant incorporated herbicides, preemergence herbicides require less tillage, but their performance is more dependent upon timely rainfall. Preemergence herbicides, however, have performed better than herbicides that are poorly incorporated. With conservation tillage, a higher application rate of surface-applied herbicides may be required for satisfactory weed control, especially in fields with considerable weed infestation or crop residue. Do not, however, use a higher rate than that stated on the label. Use great care when selecting herbicides and choosing application rates.

Postemergence herbicides, which are not influenced by crop residues or soil action, may be a logical choice with some conservation tillage systems. However, the effectiveness of postemergence herbicides is greatly influenced by climatic conditions and weed size.

No-till and double-crop

Corn, sorghum, and soybeans can be planted without seedbed preparation, either in last year's crop residue (no-till) or as a second crop after a small-grain harvest or forage removal (double-crop). Because it conserves soil, soil moisture, and time, no-till planting has greatly improved the probability of success with double-cropping.

Several precautions should be observed in no-till cropping systems. Crop seed should be planted to the proper depth and adequately covered to avoid possible contact with herbicide sprays. (Several herbicide labels give the planting depths that are necessary to avoid possible injury.) Preemergence applications may give better weed control than preplant applications because the planting process may expose untreated soil that contains viable weed seed. The total reliance on chemical weed control and the large amounts of crop residue present under no-till cropping systems may require that the higher labeled rates of soil-applied herbicides be used to obtain acceptable weed control.

Control of existing vegetation in reduced tillage programs

Existing vegetation may be a perennial sod (grass, legume, or legume-grass), an annual cover crop, or weeds. Perennial legume sods can often be controlled before planting corn or sorghum by preplant applications of 2,4-D or Banvel. Banvel can be used in the fall (but not in spring) before planting soybeans. Some perennial grass sods can be controlled with Roundup. Fall applications may be more effective than early spring applications. If a cutting of forages is removed before no-till planting, there must be sufficient regrowth of the forage before herbicides are applied.

Existing vegetation of small annual weeds that are less than 2 inches tall can often be controlled by residual herbicides that have postemergence activity. Bladex, atrazine, Sencor, Lexone, Preview, Lorox, Lorox Plus, and Scepter have both preemergence and postemergence activity. Postemergence activity is often increased by the addition of surfactants or the use of liquid fertilizer as a carrier instead of water.

Early preplant application of labeled residual herbicides can often prevent existing vegetation from being a problem before planting. Applications made too early may need an additional preemergence or postemergence herbicide application to increase the period of weed control. See the section entitled "Preplant not incorporated" for more information. If annual vegetation is over 2 to 3 inches tall, a burndown or translocated herbicide should be used. Most postemergence herbicides do not have residual activity. Gramoxone Super and Roundup are often used with preemergence herbicides to control existing vegetation.

Gramoxone Super (1½ to 2½ pints per acre) plus a *nonionic* surfactant can be used to "knock down" existing foliage before crop emergence. Smartweed, giant ragweed, and fall panicum may not be controlled if they are more than 4 to 6 inches high. A minimum of 40 gallons or more of spray per acre is suggested to ensure adequate coverage of the foliage. Gramoxone can be applied with certain liquid fertilizers. *Do not apply* with suspension or high-phosphate liquid fertilizers.

Colonel is a premix of paraquat plus atrazine for preplant use in corn or grain sorghum. **Prelude** is a premix of paraquat plus linuron plus metolachlor (Dual) for preplant use in soybeans or grain sorghum (must have Concep II seed treatment).

Roundup (3 to 8 pints per acre) is another alternative for control of existing vegetation before crop emergence in situations where fall panicum, smartweed, or certain perennial weeds are a problem. Roundup can translocate to the roots to give better control of perennials. Use 10 to 40 gallons of spray volume per acre. Roundup plus 2,4-D can be used in some situations to improve broadleaf control.

For control of small annual weeds, Roundup can be used at a rate of 12 to 16 ounces per acre plus 0.5-percent nonionic surfactant in 5 to 10 gallons of spray solution per acre. Do not mix the Microtech formulation of Lasso with Roundup.

Bronco is a formulated mixture of glyphosate (Roundup) plus alachlor (Lasso). Application rates are 4 to 5 quarts per acre. Bronco may be applied in 10 to 30 gallons of water or in 10 to 50 gallons of 28-percent or 32-percent liquid nitrogen solutions. Applications with a nitrogen solution should be made only for control of annual weeds that are less than 6 inches tall.

Roundup, Gramoxone, and Bronco are registered for use in combination with the preemergence herbicides indicated in Table 1. See the sections entitled "Herbicides for corn" and "Herbicides for soybeans" for more information about these products.

Herbicides for corn

Herbicides mentioned in this section are registered for use on field corn and also on silage corn unless otherwise specified. See Table 2 for registered combinations. Herbicide suggestions for sweet corn and popcorn may be found in Circular 907, *1988 Weed Management Guide for Commercial Vegetable Growers.* Growers producing hybrid seed corn should check with the contracting company or inbred-seed producer about tolerance of the parent lines.

Preplant not incorporated

Interest in early preplant application is increasing, especially with the trend toward reduced tillage. Bladex, Banvel, and atrazine have postemergence as well as residual activity. Early weeds such as smartweed can be controlled while they are small, and emergence of other weeds can be curtailed.

With **AAtrex, Dual,** or **Bicep**, preplant surface application may be made using a two-thirds rate as long as 45 days before planting, followed by a one-third rate at planting. A single application can be made within 30 days before planting.

Lariat (alachlor + atrazine) can be used as a preplant plus preemergence 60/40 percent split application on medium to fine textured soils. The preplant application can be made up to 30 days before planting. The rate is 5 to 6 quarts per acre.

Bladex may be applied early preplant at labeled rates, but if applied earlier than 15 days before planting, a split application or use of another herbicide at or after planting is suggested. **Conquest** and **Extrazine** can also be applied 15 to 30 days prior to planting corn.

Banvel (dicamba) applied before planting no-till corn can control emerged and actively growing broadleaf weeds. Use 1 pint per acre for medium and fine textured soils and ½ pint on coarse soils with over 2 percent organic matter. When planting into a legume sod (alfalfa or clover), apply ½ to 1 pint of Banvel after 4 to 6 inches of regrowth of the legume. A follow-up postemergence treatment may be needed.

Marksman (dicamba + atrazine) may be used as a preplant treatment in no-till corn. The rate is 3.5 pints per acre on medium and fine textured soils that have 2 percent or more organic matter. See the postemergence section for more information.

2,4-D can be used to control existing vegetation in minimum tillage and no-till situations before planting corn. Many preplant tank-mixes labels allow for 1 to 2 pints of 2,4-D LV ester per acre, but see the specific label for exact details.

Roundup can be used preplant to corn or sorghum at ¾ to 1 pint (12 to 16 fluid ounces) per acre to control small annual weeds. Use 5 to 10 gallons of water per acre plus a nonionic surfactant. Roundup may be mixed with Banvel or 2,4-D.

Preplant incorporated herbicides

Some herbicides may be applied prior to planting and incorporated. The time of application will depend upon the label directions and field conditions. Herbicides with sufficient residual activity may be applied early preplant. If applied too early, however, weed control may not last as long after planting as desired. Incorporation should distribute the herbicide uniformly throughout about the top 2 inches of soil. *Do not apply preplant herbicides too early or incorporate them too deeply.*

Sutan+, Genate Plus (butylate), Eradicane, and Eradicane Extra (EPTC) contain crop safening agents. Crop injury is unlikely but may occur when growing conditions are unfavorable or when certain hybrids are used. Eradicane Extra also contains an extender to lengthen weed control. These herbicides control annual grass weeds and at higher rates can control or suppress shattercane and johnsongrass. The rate for Sutan+ and Genate Plus is 4¾ to 7⅓ pints per acre. The rate for Eradicane 6.7E is 4¾ to 7⅓ pints per acre. The

rate for Eradicane Extra 6E is 5⅓ to 8 pints per acre. Use the higher rates for heavy infestations of shattercane and yellow nutsedge and for johnsongrass.

Application close to planting is generally preferred in order to provide maximum length of weed control. These herbicides should be incorporated into the soil soon after application, although 4 hours may be allowed with the high rate and a dry soil.

Sutan+, Genate Plus, Eradicane, or Eradicane Extra can be tank-mixed with atrazine or Bladex to improve broadleaf control. The atrazine rate is 2 to 3 pints of 4L or equivalent amounts of 80W or 90WDG per acre. The Bladex rate is 3 to 4 pints of 4L or 2 to 2½ pounds of 80W per acre. Three-way combinations with atrazine plus Bladex are also registered.

Table 1. Registered No-Till Herbicide Combinations

	Alone	Combination			
		Dual	Lasso	Surflan	Prowl
Soybeans					
Amiben	GR	GR	GR	GR	GR
Lorox, Lorox Plus	GBR	GR	GR	GR	G
Lexone, Preview	GBR	GR	GR	GR	G
Scepter	GBR	GR	GR	—	GR
Sencor	GBR	GR	GR	GR	G
Turbo	GR	—	—	—	—
Corn					
Atrazine	GBR	GR	GR	—	—
Bladex	GBR	G	GR	—	—
Princep	BR	GR	GR	—	—
Conquest	G	G	G	—	—
Extrazine	G	G	G	—	—
Atrazine + Princep	GBR	GR	GR	—	—
Bicep	GR	—	—	—	—

Knockdown herbicides:
G = Gramoxone Super (paraquat)
R = Roundup (glyphosate)
B = Bronco = Roundup + Lasso
— = Not registered

Table 2. Registered Herbicide Combinations for Preplant Incorporated (PPI), Preemergence (Pre), or Early Postemergence (EPoE) Application in Corn

	Atrazine	Bladex	Conquest or Extrazine	Princep	Atrazine + Princep
PPI only					
Eradicane	1	1	1	1	—
Genate Plus	1	1	1	—	—
Sutan +	1	1	1	1	—
PPI or Pre or EPoE					
Used alone	1,2,3	1,2,3	1,2,3	1,2	1,2
Dual	1,2,3	1,2	1,2	1,2	1,2
Lasso	1,2,3	1,2	1,2	2	—

1 = Preplant incorporated
2 = Preemergence
3 = Early postemergence
— = Not registered

Sutazine and Rhino (butylate plus atrazine) contain different ratios of active ingredients. Sutazine+ 6ME contains 4.8 pounds of butylate and 1.2 pounds of atrazine per gallon. The rate is 5½ to 10½ pints per acre. Rhino 6E contains 4.3 pounds of butylate and 1.7 pounds of atrazine per gallon and the rate is 6 to 11.7 pints per acre.

Preplant or preemergence herbicides

Incorporation of the following herbicides is optional, depending upon the weeds to be controlled and the likelihood of rainfall. Incorporation of these herbicides should be shallow but thorough.

AAtrex, Atrazine (atrazine), or Princep (simazine) can be applied anytime during the 2 weeks before planting or soon after planting. If rainfall is limited, incorporation may aid performance. Corn tolerance of atrazine and simazine is good, but carryover to subsequent crops can occur.

Princep controls fall panicum and crabgrass better than atrazine does but is less effective in controlling cocklebur, velvetleaf, and yellow nutsedge. Princep is less soluble and more persistent than atrazine; thus Princep is usually applied preplant. Princep plus atrazine can be used in 1:1 or 2:1 combinations; the total rate is the same as for atrazine used alone.

The rate for atrazine used alone is 2½ to 3¾ pounds of atrazine 80W, 4 to 6 pints of 4L, or 2.2 to 3.3 pounds of AAtrex Nine-0. Atrazine controls annual broadleaf weeds better than it does grasses, and it is often used at reduced rates in tank-mix combinations to improve broadleaf weed control. The rate for atrazine in combinations is 1½ to 2 pounds of atrazine 80W, 2 to 3 pints of atrazine 4L, or 1.1 to 1.8 pounds of AAtrex Nine-0. These rates may not provide adequate control of cocklebur, morningglory, and velvetleaf, but can reduce the risk of carryover.

You can minimize carryover injury by mixing and applying the herbicides accurately, by applying them early, by using the lowest rates consistent with good weed control, and by tilling the soil to dilute the herbicide. The risk of carryover is greater after a cool, dry season and on soils with a pH over 7.3.

If you use atrazine at more than 3 pounds of active ingredient per acre (lbs a.i./A) or if you apply after June 10, plant only corn or sorghum the next year. If you use atrazine in the spring and must replant, then plant only corn or sorghum that year. Do not plant small grains, small-seeded legumes, or vegetables in the fall or the following spring. Soybeans planted the year after an application of atrazine can also be affected by carryover, especially if you use Sencor or Lexone.

Bladex (cyanazine) has shorter soil persistence than atrazine, but atrazine has better corn tolerance. Rates of Bladex must be selecied accurately on the basis of soil texture and organic matter to reduce the possibility of corn injury. The rates per acre for Bladex alone are

1.5 to 6 pounds of 80W, 1.35 to 5.3 pounds of 90DF, or 1.25 to 4.75 quarts of 4L. You can lessen the risk of corn injury by using reduced rates of Bladex in combination with other herbicides.

Bladex provides better control of most annual grasses than does atrazine, but is weaker than atrazine on several broadleaf weeds, particularly pigweed. Bladex and atrazine can be tank-mixed in a 3:1, 2:1, or 1:1 ratio (see label for rates). The higher ratio will provide better broadleaf weed control.

Conquest and Extrazine contain different ratios of cyanazine (Bladex) and atrazine. Conquest (3:1 ratio) is better adapted to darker soils with uniform texture, while Extrazine (2:1 ratio) is best adapted to the lighter soils of variable texture. They are available as 90DF and 4L formulations and can be used preplant incorporated, preemergence, or in tank-mix combinations similar to Bladex. (See Table 2.) Rates must be adjusted carefully to the soil texture and organic matter content.

Bladex can be tank-mixed with Genate, Sutan, or Eradicane for preplant incorporation or with Lasso or Dual for preplant or preemergence application. *Bladex, Conquest, and Extrazine are restricted-use pesticides.*

Lasso (alachlor) or Dual (metolachlor) can be preplant incorporated or applied preemergence at planting time. Preplant incorporation of these herbicides can improve control of yellow nutsedge and can lessen dependence upon rainfall. Incorporation should distribute the herbicide evenly throughout the top 2 inches of soil.

Lasso and Dual control annual grasses and help control yellow nutsedge. You can improve broadleaf weed control by using atrazine, Bladex, or both in either a preplant or a preemergence combination.

Lasso can be applied anytime during the week before planting corn and shallowly incorporated, or it can be used after planting but before the crop and weeds emerge and within 5 days after the last tillage operation. The rate is 2 to 4 quarts of Lasso 4E or 16 to 26 pounds of Lasso 15G per acre. Use the higher rate suggested for the type of soil if you plan to incorporate Lasso.

Dual can be applied and shallowly incorporated anytime during the 2 weeks before planting corn, or it can be used soon after planting. The rates are 1½ to 4 pints of Dual 8E or 6 to 16 pounds of Dual 25G per acre.

Lasso or Dual plus atrazine can be preplant incorporated or applied after planting until corn is 5 inches tall and grass weeds have not passed the two-leaf stage. *Do not apply with liquid fertilizer after the crop emerges.* The suggested rate is 1½ to 4 quarts of Lasso or 1¼ to 2½ pints of Dual 8E plus 1½ to 2½ pounds of atrazine 80W, 1 to 2 quarts of atrazine 4L, or 1.1 to 2.2 pounds of AAtrex Nine-O per acre. Dual is also cleared in a combination with atrazine plus Princep.

Bicep 6L is a 5:4 premix of metolachlor (Dual) plus atrazine used at 1½ to 3 quarts per acre. **Lariat 4L** is a 5:3 premix of alachlor (Lasso) plus atrazine used at 2½ to 4½ quarts per acre.

Dual or Lasso plus Bladex can be applied before planting and incorporated, or they can be applied preemergence at planting. The rate is 2 to 4 quarts of Lasso 4E or 1¼ to 2½ pints of Dual 8E plus 1 to 3¾ pounds of Bladex 80W or 1 to 3 quarts of Bladex 4L per acre. Adjust the rate carefully according to soil texture and organic matter.

Preemergence herbicides

Ramrod (propachlor) can be applied alone before the crop or weeds emerge or with atrazine after the corn is planted but before grasses reach the 2-leaf stage and corn emerges. Ramrod performs well on soils with more than 3-percent organic matter.

Ramrod is irritating to the skin and eyes, so observe label precautions. Corn tolerance is good. Ramrod controls annual grasses and pigweed. The rate is 4 to 6 quarts of Ramrod 4L or 20 to 30 pounds of 20G per acre.

Banvel (dicamba) may be applied immediately after planting at 1 pint per acre on medium to fine textured soils having 2 percent or greater organic matter. Do not apply preemergence to coarse textured soils or any soils having less than 2 percent organic matter (4 percent on Lasso label). Banvel may be applied preemergence to early postemergence in tank-mix combinations with atrazine, Bladex, Lasso, Dual, or Prowl. **Marksman** is a premix of dicamba (Banvel) with atrazine. Refer to the labels for rates, timing, and precautions when using these combinations.

Prowl (pendimethalin) may be used in corn only after planting (do not incorporate). Corn should be planted at least 1½ inches deep. It can control annual grasses, pigweed, and lambsquarters. The Prowl rate is 1½ to 4 pints alone or 1½ to 3 pints in combinations with atrazine or Bladex. **Prozine 70DF** is a 1:1 premix of pendimethalin (Prowl) plus atrazine used at 3 to 4¼ pounds per acre. The tank-mixes and premix can be applied after corn emergence but before the crop reaches the 4-leaf stage and weeds reach the 1-inch stage. Avoid postemergence application when corn is under stress from cool, wet weather. Do not apply postemergence in liquid fertilizer.

Postemergence herbicides

Lasso, Dual, Ramrod, or Prowl may be combined with atrazine for application after planting to very early postemergence. The same is true for Lasso or Dual combined with Banvel. To obtain satisfactory control, apply before grasses reach the 2-leaf stage. Early postemergence applications should be made using water and not liquid fertilizer as a carrier. For more information, see the section on "Postemergence herbicide principles."

Atrazine can be applied when grass weeds are no more than 1½ inches high. Many annual broadleaf seedlings are more susceptible than grass weeds and may be treated until they are 4 inches tall. For control of some broadleaf weeds, 1.2 pounds active ingredient of atrazine may be sufficient. In most cases, this rate will need to be increased to 2 pounds for control of annual grass weeds.

The addition of oil-surfactant mixes or surfactants has generally increased the effectiveness of postemergence atrazine. Crop oil concentrates (COC) (80 percent oil and 20 percent surfactant) are used at the rate of one quart per acre. Surfactants are usually added at 0.5 percent of the total spray volume or at a rate of about one pint per acre. Results with the oil-surfactant mixes have generally been better than those with surfactants alone.

An atrazine-and-oil mix sometimes injures corn that has been under stress from prolonged cold, wet weather or other factors. Do not use more than 2½ pounds of atrazine 80W, 2 quarts of atrazine 4L, or 2.2 pounds AAtrex Nine-O per acre if you mix with oil or oil concentrate. *Do not add 2,4-D to the atrazine-oil treatment, or severe injury may result.* Mix the atrazine with water first, and add the oil last. If atrazine is applied after June 10, do not plant any crop except corn or sorghum the next year.

Bladex (cyanazine) can be applied until the fifth leaf of corn is visible and before grass weeds exceed 1.5 inches in height. The rate is 1.5 to 2.5 pounds Bladex 80W or 1.1 to 2.2 pounds Bladex 90DF per acre. *Do not use Bladex 4L postemergence.* A tank-mix of Bladex and atrazine or the premixes Conquest or Extrazine can also be applied postemergence.

Do not apply Bladex alone or with atrazine (tank-mix or premix) postemergence either in cold, wet weather or to corn that is stressed. Injury to corn is more likely under these conditions. Under droughty conditions, certain agricultural surfactants or vegetable oils may be added to Bladex 80W and 90DF. Do not use these spray additives with Conquest or Extrazine. Do not use petroleum crop oils or apply with liquid fertilizers. Do not apply to corn grown for "seed". *Bladex, Conquest, and Extrazine are all classified as restricted-use pesticides.*

Tandem (tridiphane) may be used with atrazine, Bladex, or both for postemergence control of both annual grass and broadleaf weeds in field corn. These combinations should be applied when annual grass weeds are in the 1- to 3-leaf stage and actively growing. The rates per acre are 1 to 1½ pints of Tandem plus 1½ to 4 pints of atrazine 4L (equivalent rates of 80W or 90DF) or 1 to 2½ pounds of Bladex 80W (equivalent rates of 90DF). *Do not use Bladex 4L.* Crop oil concentrate (2 pints per acre) should be used with the tank-mixes that do not contain Bladex. Combinations containing Bladex should not be applied to corn under stress from cold or wet weather, to corn with more than 4 true leaves, or if rain is expected within 3 hours. Special programs are labeled for control of larger grasses, woolly cupgrass, and wild proso millet. See the Tandem label for more information on these programs.

Banvel (dicamba) may be applied early postemergence when corn is in the spike to 5-leaf stage or up to 8 inches tall. The rate is 1 pint of Banvel per acre on medium and fine textured soils or ½ pint on coarse textured soils. Corn tolerance is better and the potential for drift is less with the early treatment. It can be tank-mixed with Lasso, Dual, Bladex (not 4L), or atrazine and applied early postemergence. See the label for rates, timing, and precautions.

Marksman is a 1:2 premix of dicamba (Banvel) and atrazine which can be applied when corn is in the spike to 5-leaf stage. The rate is 3½ pints per acre on medium or fine textured soils that contain over 2 percent organic matter. Marksman can be tank mixed with Bladex (not 4L), Dual, Lasso, or 2,4-D for early postemergence application similar to that for Banvel. See the label for rates, timing, and precautions. Drift precautions are the same as with Banvel.

If weeds are drought-stressed, the addition of an approved agricultural surfactant to Banvel or Marksman will improve coverage and control. Do not use adjuvants containing penetrants such as petroleum or crop oils because corn injury can be severe.

Banvel may also be applied at ½ pint per acre to corn more than 8 inches tall but less than 36 inches tall. Weeds should be less than 12 inches tall for best control. Use drop nozzles on corn over 8 inches tall (Banvel alone or with 2,4-D) to improve corn tolerance and improve spray coverage to the weeds. Do not apply Banvel within 15 days of tassel emergence.

Do not apply Banvel where soybeans are growing nearby if corn is more than 24 inches tall, soybeans are more than 10 inches tall, or the soybeans have begun to bloom, whichever comes first. Observe all label precautions concerning spray pressure, spray volume, nozzle selection, wind speed, and temperature to minimize risk of vapor or spray drift to nearby susceptible crop or ornamental plants.

A preharvest treatment of Banvel plus 2,4-D can help control hemp dogbane. Apply after the brown silk stage in corn but at least 7 days before harvest at the rate of ½ pint of Banvel with 1 pound acid equivalent 2,4-D LV ester or amine per acre. Nearby soybeans must be fully podded, with leaves turning yellow. The hemp dogbane must have green leaves and roots with pink buds. Do not apply near homesteads or residential districts.

2,4-D is effective in controlling many broadleaf weeds in corn. If corn is more than 8 inches high, use drop nozzles to decrease the possibility of injury. If you direct the nozzles toward the row, adjust the spray

concentration so that excessive amounts are not applied to the corn.

Do not apply 2,4-D to corn from the tasseling stage to the dough stage. After the hard dough to dent stage, you can apply 1 to 2 pints of certain 2,4-Ds by air or high-clearance equipment to control some broadleaf weeds that may interfere with harvest or to suppress certain perennial weeds. Do not forage or feed fodder for 7 days after treatment.

The suggested broadcast rate is ⅓ to ½ pint of ester or 1 pint of amine for formulations with 3.8 pounds of 2,4-D acid equivalent per gallon. Use equivalent rates with other formulation concentrations. Use proportionately less 2,4-D when using directed nozzles.

The ester forms of 2,4-D can vaporize and injure nearby susceptible plants. This vapor movement is more likely with high-volatile esters than with low-volatile esters. Spray particles of either the ester or the amine form can drift and cause injury.

Corn is often brittle for 7 to 10 days after application of 2,4-D and thus is susceptible to stalk breakage from high winds or cultivation. Other symptoms of 2,4-D injury are stalk bending or lodging, abnormal brace roots, and failure of leaves to unroll. Injury problems are unlikely once corn has reached the brown silk stage.

High temperature and high humidity can increase the potential for 2,4-D injury, especially if corn is growing rapidly. If it is necessary to spray under these conditions, it may be wise to reduce the rate by about 25 percent. Corn hybrids differ in their sensitivity, and the probability of injury increases when corn is under stress.

Buctril or Brominal (bromoxynil) may be used to control broadleaf weeds in field and silage corn. It is important to treat when the weeds are small. For ground applications, use 20 gallons of water per acre, a spray pressure of 30 psi, and flat-fan nozzles.

Bromoxynil will not volatilize and cause the drift injury associated with 2,4-D or Banvel. Under some conditions, Bromoxynil may cause temporary burning of corn leaves. Do not add a surfactant or crop oil to bromoxynil used alone or in combination.

Buctril 2E rates are 1 to 1½ pints per acre when corn and weeds are in the 3- to 8-leaf stage. Brominal 4E rates are ½ to 1 pint per acre when corn is in the 2-leaf to 14-inch stage and before weeds are 4 to 6 inches tall. Use the higher rate on larger corn and weeds. Most annual broadleaf weeds are controlled. Larger pigweed and velvetleaf may require the higher rate or a combination with atrazine.

Buctril or Brominal can be tank-mixed with atrazine 4L at ½ to 1 quart per acre (or equivalent rates of 80W or 90DF). **Buctril/atrazine 3L** is a 1:2 premix used at 1½ to 3 pints per acre. The rate varies with the size of the corn and weeds. Do not apply before the 3-leaf stage of corn.

Basagran (bentazon) can be used alone or with atrazine for postemergence broadleaf control in corn. **Laddok 3.33L** is a 1:1 pre-mix of bentazon plus atrazine used at 2.4 to 3.6 pints per acre. The Basagran rate is 1 to 1.5 pints alone or with atrazine at 0.6 to 0.9 pound of 90DF (equivalent rates of 4L or 80W) per acre. Add 28-percent UAN solution (0.5 to 1 gallon per acre) or crop oil concentrate (1 quart per acre) under all conditions. The atrazine (tank-mix or premix) improves control of velvetleaf, annual morningglory, pigweed, and lambsquarters.

Roundup (glyphosate) may be applied as a spot treatment in corn prior to silking. For applications made on a spray-to-wet basis, use a 1- to 2-percent solution of Roundup in water. Avoid contact of spray with the corn.

Postemergence soil-applied herbicides

Some soil-applied herbicides can be applied to the soil as a postemergence treatment in corn. It may be necessary to use drop nozzles to avoid interference from corn leaves and ensure uniform application to the soil.

Prowl (pendimethalin) or Treflan (trifluralin) may be applied to the soil and incorporated after field corn is 4 inches tall (for Prowl) or 8 inches tall (for Treflan) and up to the time of the last cultivation. The field should be cultivated to control existing weeds and cover the roots at the base of the corn before application. The herbicide should then be thoroughly and uniformly incorporated into the top inch of the soil with a sweep-type or rolling cultivator. Prowl may not need to be incorporated if irrigation is used or rainfall occurs soon after application. Prowl or Treflan can be combined with atrazine.

These Prowl or Treflan treatments may help control late-emerging grasses such as shattercane, wild proso millet, fall panicum, or woolly cupgrass.

Lasso (alachlor) may be used alone or with atrazine as a soil-applied postemergence treatment to help control midseason annual grass weeds in *corn that is grown for seed.* Application should preferably be made after cultivation — before weeds emerge and before the crop is 40 inches tall.

Dual (metolachlor) or Bicep (metolachlor plus atrazine) may be used for postemergence "lay-by" treatments in corn. For Dual, as much as 3 pounds active ingredient per acre may be used in a single application, up to a total of 6 pounds active ingredient in one year. With Bicep, as much as 3 quarts of 6L may be used per acre.

Directed postemergence herbicides

Directed sprays are sometimes needed for emergency situations, especially when grass weeds become too tall to be controlled by cultivation. Weeds, however,

are often too large for directed sprays to be effective. Directed sprays cannot be used on small corn because a height difference between corn and weeds is needed to keep the spray off the corn. Corn leaves that come into contact with the spray can be killed, and injury may affect yields. *Consider these to be emergency treatments.*

Lorox or Linex (linuron) may be applied as a directed spray after corn is at least 15 inches tall (freestanding) but before weeds are 8 inches tall, preferably when weeds are no more than 5 inches tall. Linuron controls broadleaf and grass weeds.

The broadcast rate is 1¼ to 3 pounds of linuron 50W or 50DF or 1¼ to 3 pints of 4L per acre, depending on weed size and soil type. Add Surfactant WK at the rate of 1 pint per 25 gallons of spray mixture. Cover the weeds with the spray, but keep it off the corn as much as possible.

Evik 80W (ametryn) is registered for directed use when corn is more than 12 inches tall and weeds are less than 6 inches tall. Evik should not be applied within 3 weeks of tasseling. The rate is 2 to 2½ pounds Evik 80W per acre (broadcast) plus 2 quarts of surfactant per 100 gallons of spray mixture. Extreme care is necessary to keep the spray from contacting the leaves.

Gramoxone Super (paraquat) can be applied as a directed spray after corn is 10 inches tall but before weeds are 4 inches tall. The rate is 1½ pint per acre in 20 to 40 gallons of water. Add 1 quart of nonionic surfactant per 100 gallons of spray volume. Broadleaf weed control can be improved with the addition of 1 to 2 pints per acre of atrazine 4L (or equivalent rates of 80W). Observe all label precautions. *Gramoxone Super is a restricted-use pesticide.*

Herbicides for sorghum

Many herbicides used to control weeds in corn can also be used in sorghum.

Bronco (glyphosate plus alachlor) may be used alone or with atrazine where grain sorghum is to be planted directly into a cover crop or in the residue of the previous crop. Bronco can control emerged annual weeds and may suppress many emerged perennial weeds, as well as give preemergence grass control. Grain sorghum seed must be treated with Screen (flurazole), as it is when Lasso is used.

Gramoxone Super (paraquat) can control annual weeds where grain sorghum is to be planted into the residue of the previous crop. **Colonel** (paraquat plus atrazine) can be applied preplant before planting sorghum. **Prelude** (paraquat plus linuron plus metolachlor) can be used on Concep II-treated grain sorghum. *Gramoxone Super, Colonel, and Prelude are restricted-use pesticides.*

Atrazine may be used for weed control in sorghum (grain and forage types) or sorghum-sudan hybrids. Application may be made preemergence or postemergence. A preplant surface application may be made using a single application within 30 days of planting or a two-thirds plus one-third split application within 45 days of planting. Plant seed at least one inch deep. Do not use preplant or preemergence on soils with less than 1-percent organic matter. Incorporated treatments may cause injury if rainfall occurs before or shortly after sorghum emergence.

Injury may occur when sorghum is under stress from unusual soil or weather conditions or when rates are too high. The rate of application for preplant and preemergence is 2 to 3 pounds of atrazine 80W per acre. The postemergence rate is 4 to 6 pints 4L per acre without crop oil or 2.4 pints 4L (broadleaf control only) with crop oil or crop-oil concentrate. Use equivalent rates of atrazine 80W or AAtrex 90DF formulations. Rotational crop recommendations and weed control are the same as for atrazine used in corn. Failure to control fall panicum has been a major problem.

Ramrod (propachlor) may be used alone or in combination with atrazine, Milogard, or Bladex for sorghum. Ramrod can improve grass control; but rates must not be skimpy, especially on soils that are relatively low in organic matter. Do not graze or feed forage to dairy animals.

Lasso (alachlor) alone or plus atrazine may be preplant incorporated or used preemergence for grain sorghum if seed is treated with Screen (flurazole). This use also applies to Lariat and to Bronco.

Dual (metolachlor) or Bicep (metolachlor plus atrazine) can be used for sorghum if seed has been treated with Concep. These herbicides will control grasses better than will atrazine applied alone. An early preplant treatment of Dual or Bicep may be used in a similar manner as for corn, but it is still necessary to use seed that has been treated with Concep.

Basagran (bentazon) can be applied alone or with atrazine in sorghum as a postemergence treatment for broadleaf control. **Laddok** is a 1:1 premix of bentazon plus atrazine. Rates are similar to those for corn.

2,4-D may be applied postemergence for broadleaf control in sorghum that is from 4 to 24 inches tall. Use drop pipes on nozzles if sorghum is more than 8 inches tall. Rates are similar to those for use in corn. (See the section entitled "Herbicides for corn.")

Banvel (dicamba) may be applied postemergence to sorghum up to 21 days after emergence but before sorghum is 15 inches tall. The rate is ½ pint per acre. Do not graze or feed treated forage or silage before the mature grain stage. Sorghum can be injured by Banvel and seed development can be affected.

Brominal or Buctril (bromoxynil) can control small broadleaf weeds in grain sorghum from the 3-leaf up to the boot stage. A tank-mix with atrazine or the Buctril/atrazine mixture can also be used. See the label for rates, timing, and weed sizes.

Table 3. Registered Herbicide Combinations for Preplant Incorporated (PPI) or Preemergence (Pre) Use in Soybeans

	Treflan	Amiben	Sencor or Lexone	Preview	Lorox or Linex	Sencor + Scepter	Scepter	Sencor + Command	Command
PPI									
Sonalan	—	1	1	1	—	1	1	1	1
Treflan	—	1	1	1	—	1	1	1	1
Command	—	—	1	1	—	—	1[b]	—	—
Salute	—	—	—	—	—	—	1	—	1
PPI or Pre									
Dual	1	1,2	1,2	1,2	2	1,2	1,2	1	1
Lasso	1	1,2	1,2	1,2	2	1,2	1,2	1	1
Prowl	—	1,2	1,2	1,2	2	1,2	1,2	1	1
Surflan[a]	—	2	2	—	2	—	2	—	—
Turbo	—	—	—	—	—	—	1,2	—	1

1 = Preplant incorporated
2 = Preemergence
— = Not registered
[a] Not for preplant incorporation
[b] South of U.S. Rt. 36 in Illinois

Prowl (pendimethalin) may be applied to grain sorghum from the 4-inch growth stage to as late as the last cultivation, primarily for control of late-season annual grass weeds. For more information, see the subsection on postemergence soil-applied herbicides under "Herbicides for corn."

Roundup (glyphosate) may be applied as a spot treatment in sorghum (milo) prior to heading. For applications on a spray-to-wet basis, use a 1- to 2-percent solution of Roundup in water. With motorized spot treatments from which less complete coverage of weeds may result, use a 5-percent solution. Avoid contact with the sorghum.

Herbicides for Soybeans

Consider the kinds of weeds expected when you plan a herbicide program for soybeans, especially when growing soybeans in narrow rows. The herbicide selectivity table lists herbicides and their relative weed control ratings for various weeds. (See the table at the end of this guide.)

Although soybeans may be injured by some herbicides, they usually outgrow early injury with little or no effect on yield if stands have not been significantly reduced. Significant yield decreases can result when injury occurs during the bloom to pod-fill stages. Excessively shallow planting may increase the risk of injury from some herbicides. Accurate selection for soil type is essential for herbicides containing metribuzin (Lexone, Preview, Salute, Sencor, or Turbo) or linuron (Linex, Lorox, or Lorox Plus). Do not apply these herbicides after soybeans begin to emerge or severe injury can result. Always follow label instructions. See Table 3 for some preplant and preemergence tank-mix combinations.

Preplant not incorporated

Early preplant application can be used in many conservation tillage programs — such as no-till, ridge-till, or mulch-till — to minimize existing vegetation problems at planting and thus reduce the need for knockdown herbicides. Lorox or Linex (linuron) and Sencor or Lexone (metribuzin) have both postemergence and residual activity, but postemergence activity varies with climatic conditions. If weeds have emerged before preplant application, the use of a foliar knockdown herbicide such as Gramoxone or Roundup may be necessary. (See the subsection on no-till and double-crop under "Conservation tillage and weed control.")

Several preemergence herbicides are registered for application before planting soybeans.

Surflan (oryzalin) can be applied anytime before planting no-till soybeans. Surflan can be applied in fully tillered wheat before heading, and soybeans can then be planted no-till into wheat before harvest or in wheat stubble immediately after harvest.

Surflan is labeled for tank-mixing with 2,4-D prior to 30 days before planting to control established winter weeds where soybeans are to be planted no-till. To control existing vegetation, Gramoxone or Roundup combinations with Surflan plus Sencor or Lexone can be applied before planting no-till soybeans. Surflan plus Lexone can be applied as much as 30 days before planting.

Dual (metolachlor) can be applied within 30 days before planting soybeans or as a split application using a two-thirds rate as early as 45 days before planting, followed by a one-third rate at planting.

Either Turbo alone or Sencor applied with Lasso or Dual can be applied 15 to 30 days before planting

soybeans when using a sequential (split) preemergence application: the first made early, followed by the second at planting.

Some foliar postemergence herbicides can also be used before planting soybeans.

Roundup (glyphosate) can also be used preplant in soybeans to control small annual weeds. The rate is 12 to 16 fluid ounces (¾ to 1 pint) per acre in 5 to 10 gallons of water, with the addition of a surfactant.

Poast (sethoxydim) may be applied before planting soybeans, with no time interval restriction. Poast plus 2,4-DLV (low volatile ester) as a tank-mix may be applied prior to 30 days before soybean planting. Recommended use rates per acre are ½ pint Poast and 1 pint 2,4-D (½ pound acid equivalent) with 2 pints crop-oil concentrate in 5 to 10 gallons of spray solution.

2,4-D is registered for preplant application with certain soybean herbicides to control broadleaf weeds in no-till programs. Application must be made at least 30 days prior to planting. *The use of 2,4-D less than 30 days prior to planting soybeans is not registered and is illegal.*

Preplant incorporated herbicides

Incorporation is required for Treflan, Sonalan, and Vernam. Incorporation of Command is required to reduce movement outside the target area. Incorporation is optional for Amiben, Dual, Lasso, Preview, Prowl, and Scepter when used alone or in some combinations. Lorox, Lorox Plus, and Surflan should not be incorporated.

Incorporation can improve performance if rainfall is limited and may increase the effectiveness of Dual or Lasso in controlling nutsedge. Incorporation should distribute the herbicide evenly in the top 1 to 3 inches of soil. Deep incorporation or very early application of the herbicide can cause significant reductions in weed control. For more information, see the section entitled "Herbicide incorporation."

Treflan, Prowl, and Sonalan are dinitroaniline herbicides for preplant incorporation before planting soybeans. Treflan and Sonalan must be incorporated, but incorporation is optional with Prowl. However, variable weed control and soybean injury may result if Prowl is not incorporated. See label for incorporation instructions.

Treflan, Prowl, and Sonalan control annual grasses, pigweed, and lambsquarters, and may provide some control of smartweed and annual morningglory. Prowl partially controls velvetleaf, while Sonolan suppresses black nightshade at the higher rates. Most other broadleaf weeds require combinations (see Table 3) or sequential treatments with other herbicides.

Soybeans are sometimes injured by dinitroaniline herbicides. Plants that have been injured by incorporated treatments may be stunted and have swollen hypocotyls and shortened lateral roots. Usually, such injuries are not serious. At the level of the soil surface, plants injured by preemergence applications may have stem calluses, which can cause lodging and yield loss.

Corn, sorghum, and small grains may be injured if they are grown after a soybean crop that has been treated with a dinitroaniline herbicide. The symptoms are poor germination and stunted, purple plants with poor root systems. To avoid carryover, use no more than the recommended rates and be sure that application and incorporation are uniform. The likelihood of carryover increases with double-cropping or late application and after a cool, dry season. Adequate tillage may help dilute herbicide residue, which helps alleviate a carryover problem.

Treflan or Trilin (trifluralin) may be applied alone anytime in the spring. However, tank-mixes may specify a period closer to soybean planting. Incorporate within 24 hours after application or within 8 hours if soil is warm and moist. The Treflan rate per acre is 1 to 2 pints 4E or MTF (or equivalent rates of Pro-5 or 10G). A slightly higher rate may be specified for shattercane control. A lower rate may be specified in some tank mixtures. Treflan can be tank-mixed with many different herbicides to improve broadleaf weed control (see Table 3).

Sonalan (ethalfluralin) may be applied at 1½ to 3 pints per acre within 3 weeks before planting and should be incorporated within 2 days after application. There is a greater risk of soybean injury from Sonalan than with Treflan, however Sonalan is less likely to carry over and injure corn the following year. Sonalan may be tank-mixed with many herbicides to improve broadleaf control (see Table 3).

Sencor or Lexone (metribuzin) plus Treflan, Sonalan, or Prowl can be tank-mixed and applied within 7 to 14 days of planting. Incorporate uniformly into the top 2 inches of soil. The rate of Sencor or Lexone in these combinations is ½ to 1 pint of 4L or ⅓ to ⅔ pound of 75DF. Use the normal rate, or slightly less, of the dinitroaniline herbicide (see labels).

The application of Sencor or Lexone can also be split, one part being incorporated and the other part applied to the surface preemergence. This method requires two applications but can give better broadleaf control and less injury than incorporating the same total amount of Sencor or Lexone in a single application.

Salute 4E is a premix of trifluralin (Treflan) plus metribuzin used at 1½ to 3 pints per acre. It can be applied up to 3 weeks prior to planting and must be incorporated within 24 hours. Do not apply to coarse soils with less than 1 percent organic matter. It may be tank-mixed with Scepter or Command to improve control of certain problem broadleaf weeds.

Command (clomazone) is used at 1½ to 2 pints per acre. It can provide excellent control of velvetleaf and annual grasses. At full rates, lambsquarters, smart-

weed, jimsonweed, and common ragweed should also be controlled. South of US 36 in Illinois, Command can be tank-mixed with Scepter to improve pigweed and cocklebur control. Command can also be tank-mixed with Sencor or Lexone to improve broadleaf weed control. See Table 3 for tank-mixes where Command is used at reduced rates for velvetleaf control.

Commence 5.25L is a premix of Command and Treflan that is used at 1¾ to 2⅔ pints per acre. Commence must be applied preplant and incorporated within 3 hours of applications. It can be tank-mixed with Sencor or Lexone. Commence has the same cropping and application restrictions as Command.

Command or Commence should be incorporated immediately after application unless the soil is dry, when they must be incorporated within 3 hours. Spray particles or vapors drifting outside the target area may cause chlorosis or bleaching of sensitive plants. Do not apply within 100 feet of ornamentals, trees, vegetables, alfalfa, or small grains; within 1,000 feet of subdivisions, towns, vegetable, or fruit production areas; or within 1,000 feet of nurseries or greenhouses.

Do not plant wheat, oats, rye, alfalfa, or seed corn in the fall or spring of the year following application of Command or Commence. Field corn, sweet corn, popcorn, sorghum, and certain vegetables may be planted 9 months after application of Command or Commence. Cover crops may follow, but stand reductions could occur. Uniform, accurate application and incorporation are needed to minimize risk of carryover. Some tank-mixes allow reduced rates. Carryover injury will appear as whitened or bleached plants after emergence.

Amiben (chloramben) can be incorporated with Treflan, Sonalan, or Prowl. The rate is 4 to 6 quarts of Amiben 2S or 2.4 to 3.6 pounds of 75DS per acre. Amiben can also be applied and incorporated with Treflan or Prowl plus Sencor or Lexone as a three-way combination.

Vernam (vernolate) can be applied within 10 days of planting and immediately incorporated. The Vernam rate per acre is 2.3 to 3.5 pints of 7E, or 20 to 30 pounds of 10G. Vernam controls annual grasses and pigweed and sometimes provides fair control of velvetleaf, yellow nutsedge, and annual morningglory. Some soybean injury may occur in the form of delayed emergence, stunting, and leaf crinkling. Tank-mixes with Treflan, Prowl, or Sonalan allow the use of a lower rate of Vernam and reduce the risk of soybean injury. **Reward 6E** is a formulation of vernolate with an extender that is being phased out of the corn belt.

Preplant or preemergence herbicides

Prowl (pendimethalin) may be applied before or after planting soybeans. It may be applied up to 60 days preplant alone, 30 days preplant with Scepter, or 7 days preplant with Sencor or Lexone. Preplant treatments should be incorporated within 7 days unless adequate rainfall occurs to incorporate the herbicide. Rates are 1 to 3 pints per acre alone and are slightly lower for tank-mixes. Prowl may be applied preemergence in tank-mixes with several herbicides to improve broadleaf weed control (see Table 3). Prowl may cause stem callousing when applied preemergence, which can lead to soybean lodging.

Lasso (alachlor) or Dual (metolachlor) can be used preplant or after planting to control annual grasses and pigweed. They can also help control yellow nutsedge and black nightshade. They can be combined with Command (preplant incorporated), with Amiben, Lexone, Sencor or Scepter (incorporated or preemergence), or with Lorox (preemergence only) to improve broadleaf weed control.

Lasso can be applied up to one week ahead of planting or after planting but before emergence. Lasso alone may be applied up to the unifoliate stage of soybeans. The Lasso rate is 2 to 4 quarts per acre of 4E or 4L (Microtech), or 16 to 26 pounds of 15G. Use the higher rate for the soil type when incorporating. A slightly lower rate may be specified for combinations.

Dual can be applied early preplant up to 30 days prior to planting or as a split preplant plus preemergence application up to 45 days prior to planting. The rate per acre is 1½ to 3 pints of 8E, or 6 to 12 pounds of 25G. A slightly lower rate may be specified for combinations than for use alone.

Amiben (chloramben) can control annual grasses and many broadleaf weeds in soybeans when used at the full rate. Do not expect control of cocklebur or annual morningglory. Control of velvetleaf and jimsonweed is often erratic. See Table 3 for some of the tank-mix combinations. Amiben occasionally injures soybeans, but usually the damage does not affect yield. Injured plants may be stunted and have abnormal, shortened roots. If rain does not occur within 3 to 5 days of an Amiben preemergence application, a rotary hoe should be used over the field. Amiben is best suited to soils that have more than 2.5-percent organic matter.

The broadcast rate for Amiben alone is 20 to 30 pounds of 10G, 4 to 6 quarts of 2S, or 2.4 to 3.6 pounds of 75DS per acre. The Amiben rate in combination is 3 to 6 quarts of 2S (1.8 to 3.6 pounds of 75DS) per acre. Use the higher rate where black nightshade, velvetleaf, or common ragweed is a problem weed.

Sencor or Lexone (metribuzin) can be applied anytime during the 1 to 2 weeks before planting and can be incorporated with Command, Dual, Lasso, Prowl, Sonalan, or Treflan. Incorporation should distribute the herbicide evenly throughout the top 2 inches of soil. Sencor or Lexone can be applied preemergence by itself or with Amiben, Dual, Lasso, Prowl, or Surflan.

Sencor or Lexone can control many annual broadleaf weeds but does not control annual morningglory. Con-

trol of giant ragweed, jimsonweed, and cocklebur is marginal at the reduced rates necessary to minimize soybean injury.

Accurately adjust rates according to soil conditions. *Do not apply to sandy soil that is low in organic matter.* Combinations allow for reduced rates and thus reduce risk of soybean injury. The combination rate of Sencor or Lexone is ½ to 1 pint of 4L or ⅓ to ⅔ pound of 75DF. You can use higher amounts as a split preplant and preemergence application. The higher amounts can improve broadleaf control but also increase the risk of soybean injury.

One symptom of soybean injury is yellowing (chlorosis) of the lower leaves at about the first-trifoliolate stage or later; it may be followed by browning of leaves and death of plants, depending upon the severity of the injury. Seedling diseases, weather stress, and atrazine carryover may increase the possibility of soybean injury. Injury may be greater on soils with a pH over 7.5. Accurate, uniform application and incorporation are essential. Some soybean varieties are more sensitive than others. Injury has sometimes occurred when organophosphate insecticides such as Thimet, Counter, Dyfonate, Lorsban, or Mocap were left in applicators used for corn planting and were inadvertently applied to soybeans that were being treated with metribuzin.

Turbo 8EC is a premix of metolachlor (Dual) and metribuzin to be applied preplant incorporated or preemergence at the rate of 1½ to 3½ pints per acre. Preplant application can be made up to 14 days before planting. Turbo can be tank-mixed with Scepter or Command to improve control of certain problem broadleaf weeds.

Preview 75DF is a premix of metribuzin (Lexone) and chlorimuron (Classic) used at 6 to 10 ounces per acre. It controls cocklebur, jimsonweed, and wild sunflower better than metribuzin alone (see Table 5). It can be applied preplant incorporated or preemergence. Do not apply after crop emergence. Combinations with other herbicides can improve grass control (see Table 3). Do not apply Preview to soils with pH greater than 6.8 to minimize potential carryover injury.

Minimum recropping intervals after application of Preview are 4 months to wheat or barley, 10 months to field corn or alfalfa, and 12 months to grain sorghum or clover. Delay planting another month if application is made after June 15. See current labeling for climatic effects on recropping. Applying Scepter or Classic the same year as Preview may change the recropping intervals (see labels).

Scepter (imazaquin) is used at ⅔ pint per acre (1 gallon for 12 acres) applied within 30 days before planting or immediately after planting. Incorporation is not required but improves weed control under low rainfall conditions and it may also improve velvetleaf and giant ragweed control. Postemergence application can control cocklebur and pigweed and is made with 0.25 percent surfactant. Do not apply within 90 days of harvest.

Scepter can control most annual broadleaf weeds if adequate rainfall is received, but is somewhat weak on velvetleaf and annual grass control (see Table 5). Grass control is improved by tank-mixing with Prowl, Treflan, Sonalan, Dual, or Lasso.

Squadron 2.33L is a 6:1 premix of pendimethalin (Prowl) and imazaquin (Scepter) used at 3 pints per acre.

Soybeans sometimes show temporary yellowing and growth retardation from applications of Scepter or Squadron. Label recrop statements on Scepter and Squadron require 4 months before planting small grains and 11 months before planting corn or sorghum. Soil and climatic conditions may extend these recrop intervals. Uniform, accurate application and incorporation can reduce the risk of carryover. If Classic, Preview, or Lorox Plus are applied the same year as Scepter or Squadron, wait 18 months before planting corn or sorghum. Carryover injury to corn appears as stunting, root inhibition, and interveinal chlorosis or purpling of the leaves.

Preemergence herbicides

Surflan (oryzalin) can control annual grasses, pigweed, and lambsquarters if rainfall is adequate. Rotary hoe to control emerging weeds if adequate rain does not fall within 7 days after application. Surflan can be used as an early preplant application for no-till soybeans. Do not use on soils that have more than 5-percent organic matter. The rate is 1 to 2 pounds per acre of Surflan 75W (¾ to 1½ quarts AS, aqueous suspension) used alone or ⅔ to 1⅔ pounds of Surflan 75W in combinations. Surflan is also available as an 85DF. Surflan can be tank-mixed with Amiben, Lorox, Lexone, or Sencor to improve control of broadleaf weeds. Surface application may be made within 2 days after planting, prior to emergence. Surflan may cause stem callusing, which can lead to soybean lodging. Do not allow Surflan to contact the soybean seed. For no-till soybeans, Surflan can be applied in fall or early spring over undisturbed stubble from the previous crop. In combination with 2,4-D, it may be applied prior to 30 days before planting.

Lorox or Linex (linuron) is best suited to silt loam soils that contain 1- to 3-percent organic matter. *Do not apply to very sandy soils.* Linuron controls broadleaf weeds better than grass weeds. It does not control annual morningglory, and control of cocklebur and jimsonweed is variable. Accurate and uniform application and proper rate selection are necessary to minimize the risk of crop injury. Tank-mix combinations allow the use of a reduced rate of linuron to decrease the risk of soybean injury, but this reduced rate may also decrease the degree of weed control.

Linuron is registered in tank-mix combinations with Amiben, Lasso, Dual, Prowl, or Surflan to improve grass control. The rate of linuron in these combinations is 1 to 1⅔ pounds of 50DF or 1 to 1⅔ pints of 4L on silt loam soils that have less than 3-percent organic matter.

Lorox Plus 60DF is a premix of linuron (Lorox) plus chlorimuron (Classic) used at 12 to 18 ounces per acre. It controls cocklebur, jimsonweed, and velvetleaf better than linuron alone (see Table 5). Tank-mixing with Lasso, Dual, Prowl, or Surflan will improve grass control. Lorox Plus should be applied after planting but before soybeans emerge. The rate is 12 to 18 ounces of Lorox Plus 60DF per acre. Do not apply to soils with organic matter less than 0.5 percent.

To minimize potential carryover injury, do not apply Lorox Plus 60DF to soils with pH greater than 6.8. There is a minimum recropping interval of 4 months to small grains and 10 months to field corn or sorghum. Add 1 month if application is made after June 15. See current labeling for climatic effects upon recropping. If applied the same year as Lorox Plus, Scepter will change and Classic may change the recropping intervals (see current labels).

Postemergence herbicides

Research suggests that soybean yields will probably not be reduced if weeds are controlled within 3 to 4 weeks after the soybeans are planted. Postemergence herbicides are most effective when their use is part of a planned program and when they are applied while the weeds are young and tender; they should not be considered simply as emergency treatments. It is especially important to use timely treatments when using postemergence herbicides in narrow-row soybeans. It is important to know what specific weeds are present in the field and the size of those weeds. Select herbicides and rates accordingly. Usually, smaller weeds are easier to control.

Registered combinations are shown in Table 4. For more information about conditions affecting application, see the section entitled "Postemergence herbicide principles" and refer to labels.

Basagran (bentazon) can control cocklebur, jimsonweed, and velvetleaf; but it is weak on pigweed, lambsquarters, and annual morningglory. It can be used for control of yellow nutsedge and Canada thistle but does not control annual grasses.

The rate for Basagran is 1 to 2 pints per acre, depending on the weed size and species. Specifics on weed size and rates are indicated on the label. Application, however, preferably should be made when weeds are small (no more than 1 to 3 inches tall) and actively growing. These conditions usually exist when the soybeans are in the unifoliolate to second-trifoliolate stage or within 2 to 3 weeks of planting. Spraying during warm, sunny weather can also improve performance. Do not spray if rain is expected within 8 hours. Use a minimum of 20 gallons of water per acre and 40 to 60 psi spray pressure to provide complete weed coverage. Adding a crop oil concentrate (COC) to Basagran may increase performance on most weeds but may cause some soybean injury. Morningglory that is up to 10 inches long can be controlled with the addition of 2 fluid ounces of 2,4-DB (Butyrac 200) to the Basagran. Do not add crop oil when mixing with 2,4-DB. Do not mix or apply Basagran with other pesticides or liquid fertilizer except as specified on the product label.

A 28-percent UAN (urea ammonium nitrate) solution — commonly referred to as 28-percent nitrogen solution — may be added to the spray mixture instead of crop oil concentrate for improved velvetleaf control. The UAN solution may be added to the tank with Basagran plus Blazer when velvetleaf is the primary target weed. Do not use brass or aluminum nozzles when spraying Basagran and 28-percent nitrogen solution.

Basagran may be applied as a split application of 1 pint plus 1 pint per acre to improve lambsquarters, giant ragweed, and yellow nutsedge control. Apply the first pint of Basagran before weeds reach the maximum size or leaf stage as indicated on the label. Make the second application of one pint 7 to 10 days after the first application.

Blazer or Tackle (acifluorfen) should be applied when broadleaf weeds are in the 2- to 4-inch stage and actively growing. Weeds controlled include annual morningglory, pigweed, jimsonweed, and black nightshade. Cocklebur and morningglory control can be improved with the addition of 2 fluid ounces of 2,4-DB. Apply the mixture when cocklebur and morningglory measure no more than 10 or 12 inches. Surfactant addition is recommended when combining Blazer and 2,4-DB, but not with Tackle plus 2,4-DB.

The rate is 1 to 3 pints of Blazer 2L or Tackle per acre. Blazer requires the addition of a nonionic surfactant at a minimum of 1 pint per 100 gallons of spray. Use of surfactant is also recommended with Tackle. The rate of surfactant may be increased to 2 to 4 pints per acre to improve control of small escaped grasses.

Because Blazer and Tackle are contact herbicides, leaf burn often occurs; however, the crop usually recovers within 2 to 3 weeks. Do not spray if rain is expected within 4 to 6 hours.

Basagran plus Blazer or Tackle provides a means of broadening the spectrum of control because Blazer or Tackle is better on pigweed and annual morningglory, while Basagran is better on cocklebur. The rate is 1 to 2 pints of each product in the combination. Addition of an adjuvant (crop oil concentrate or surfactant) is suggested. To improve velvetleaf control with Blazer or Tackle plus Basagran, use 28-percent UAN or 10-34-0 liquid fertilizer additives at labeled rates to replace the surfactant or crop oil concentrate (COC). Do not add COC when using fertilizer addi-

Table 4. Registered Postemergence Herbicide Combinations for Broadleaf Weed Control in Soybeans

	Amiben	Basagran	Blazer	2,4-DB	Scepter
Alanap	X	—	—	X	—
Amiben		—	X	X	—
Basagran	—		X	X	X
Blazer	X	X		X	X
Classic	—	—	X	—	—
Tackle	—	X	—	X	—
Rescue	—	—	X	—	—
Reflex	—	X	—	X	—

X = Registered
— = Not registered

tives. A mixture of Blazer plus Basagran plus 2,4-DB amine (2 fluid ounces) can be used to improve control of cocklebur and morningglory under dry weather conditions. Do not add COC or any other additives when using 2,4-DB with Basagran plus Blazer. Refer to individual product labels for specifics.

Cobra 2E (lactofen) is applied at 10½ to 12½ fluid ounces per acre with or without crop oil concentrate (COC) at ¼ to 1 pint per acre. Apply when weeds are small, usually before the 4- to 6-leaf stage. Use the higher rate and the COC when the weeds approach the maximum leaf stage for application (see label for specifics). Weeds controlled include cocklebur, jimsonweed, pigweed, common ragweed, and black nightshade. Annual morningglory and velvetleaf control can be enhanced by using the higher rate with COC on weeds with 4 leaves or less.

Cobra is a contact herbicide and may cause soybean leaf burn that is intensified at the higher use rate when applied with an adjuvant. The crop usually recovers 2 to 3 weeks after application. Cobra requires a rainfree period of 30 minutes after application. Combinations with other broadleaf and grass herbicides are pending approval.

Reflex 2LC (fomesfen) is used to control broadleaf weeds at 0.75 to 1 pint north of Interstate 70, or at 1¼ pints per acre south of I-70. Use a minimum of 10 gallons of spray per acre and add either crop oil concentrate at 1 percent (1 quart per 25 gallons) or nonionic surfactant at 0.25 to 0.50 percent by volume. Reflex should control pigweed, black nightshade, jimsonweed, smartweed, and common ragweed up to 4-leaf stage at the high rate. Reflex can be tank-mixed with Basagran at 1 to 2 pints per acre to improve velvetleaf and giant ragweed control, or with 2 to 3 fluid ounces of Butyrac 200 to improve control of annual morningglory, giant ragweed, and cocklebur. Do not apply Reflex beyond 3 weeks after soybean emergence. It can be tank-mixed with Fusilade or sequentially applied after Fusilade. **Tornado** is a premix of Fusilade plus Reflex. Do not spray if rain is expected within 4 hours of application. See a current label concerning recrop restrictions.

Classic (chlorimuron) is used for postemergence broadleaf weed control at ½ to ¾ ounce 25DF per acre. Use the higher rate on larger weeds. Use a minimum of 10 gallons of water per acre plus nonionic surfactant at 0.25 percent of spray volume (v/v). Crop oil concentrate (COC) at 1 percent v/v can replace the surfactant to improve weed control but may increase soybean injury. Classic may cause temporary yellowing and retardation of soybean growth. This will generally be evident 5 to 7 days after application to soybeans that have been under stress. Do not apply Classic if rain is expected within 4 hours.

Control of cocklebur, jimsonweed, wild sunflower, and yellow nutsedge is good. Pigweed control varies with rate and species. Check the label for weed sizes and rates. Velvetleaf control is improved with the use of 28-0-0 (UAN), or 10-34-0 plus COC or surfactant. Split applications approximately 14 to 21 days apart will improve control of burcucumber, giant ragweed, and annual morningglory. Do not apply over 1 ounce of Classic 25DF per acre for the season. Do not apply Classic within 60 days of harvest.

Do not apply Classic to soils with pH greater than 6.8. There is a minimum recrop interval of 3 months to plant small grains and 9 months to plant field corn, sorghum, alfalfa, or clover. If Classic is applied sequentially after Preview or Lorox Plus, the recrop interval may change (see Classic label). If Scepter is used in the same season as Classic the recrop interval does change. Carryover injury to corn is possible and would appear as stunting, root inhibition, and interveinal chlorosis or purpling of leaves.

Amiben (chloramben) can be used for postemergence application on soybeans in the cracking to fourth-trifoliolate stage, but only within 33 days after planting. This treatment can be especially helpful in controlling velvetleaf; but smartweed, common ragweed, and pigweed may also be controlled or suppressed. Velvetleaf may be 1 to 8 inches tall, and the others may be 1 to 3 inches tall. For ground applications, 10 to 20 gallons of water per acre, a spray pressure of 30 psi, and flat-fan nozzle tips are suggested. Use 6 quarts of Amiben 2S or 3.6 pounds of Amiben 75DF plus 1 quart of crop oil concentrate per acre. Amiben can be tank-mixed with Butyrac 200, Alanap, or Blazer, and applied postemergence. See the Amiben label for specific information.

Rescue (naptalam plus 2,4-DB) can be used for midseason to late-season postemergence control of cocklebur, giant ragweed, and wild sunflower; it may also suppress annual morningglory. Apply 2 to 3 quarts per acre after soybeans are about 14 inches tall or after first bloom. Rescue can be tank-mixed with Blazer (1 to 1½ pints per acre) to improve control of morningglory, jimsonweed, pigweed, and common ragweed and to provide faster knockdown of weeds. Crop oil concentrate or a nonionic surfactant should be added at the manufacturer's recommended rate. Fertilizer solutions used as spray adjuvants, for example 10-34-0, can be used at 1 quart per acre. The water volume per acre is 10 to 25 gallons for ground application and

a minimum of 5 gallons for aerial application. If rain occurs within 6 hours, effectiveness may be reduced. Activity may not be very noticeable until 10 to 14 days after application; maximum activity should occur 20 to 30 days after application. Crop injury such as leaf twisting and terminal droop may occur. To avoid possible yield losses, do not apply Rescue to soybeans under stress from drought, disease, or injury from another herbicide. *Do not apply Rescue within 60 days of harvest.*

Poast (sethoxydim) can control many annual and some perennial grasses in soybeans. Apply ¾ pint per acre to control giant or green foxtail, barnyardgrass, and fall panicum up to 4 inches tall, or 1 pint per acre on grasses up to 8 inches tall. Apply 1½ pints per acre as a rescue treatment if grasses are actively growing (see label for species and sizes). Volunteer corn requires ¾ to 1 pint per acre depending upon weed size. Always use 2 pints per acre of crop oil concentrate or Dash (special adjuvant) with Poast. Fertilizer additives (see below) are recommended for volunteer corn and volunteer cereals. Volunteer cereals less than 6 inches tall (not tillered or overwintered) can be controlled with 1½ pints per acre.

The addition of 28-percent UAN (1 gallon per acre) or spray grade ammonium sulfate (2½ pounds per acre) may improve grass control. Components should be added slowly, with agitation, in the following sequence: (1) fertilizer additive, (2) Dash or crop oil concentrate, and (3) Poast. After using fertilizer additives, rinse the entire spray system with water to reduce corrosion.

The spray volume is 5 to 20 gallons per acre for ground applications or a minimum of 5 gallons per acre for aerial applications. Lower volumes often result in more consistent grass control. Use only standard high-pressure, hollow-cone, or flat-fan nozzles at 40 to 60 psi. Do not cultivate within 5 days before or 7 days after application. Do not apply Poast to grasses under stress from hot, dry weather or herbicide injury. Do not apply if rainfall is expected within 1 hour.

Poast plus Basagran can be tank-mixed. If Dash (1 quart per acre) plus 28-percent UAN solution (1 gallon per acre) are used, the rate of Poast is 1 pint per acre. Use 1½ pint of Poast per acre if crop oil concentrate (COC) is used. Apply the tank mix before broadleaf or grass weeds exceed maximum specified sizes.

Poast plus Blazer (1½ to 2 pints) can be tank-mixed. Use 1 pint of Poast for fall panicum or giant foxtail that are 3 to 8 inches tall. For other annual grasses listed on the Poast label use 1½ pints per acre. Use crop oil concentrate and not fertilizer additives with this tank-mix. Sequential application is necessary for perennials and may be more economical for control of annuals.

Fusilade 2000 (fluazifop) can be used for postemergence control of annual and perennial grass weeds in soybeans. Apply only to actively growing grasses before they tiller. The rate is 1½ pints per acre when giant foxtail is 2 to 6 inches tall and other annual grass weeds are 2 to 4 inches tall. Use ¾ pint per acre when volunteer corn is 12 to 24 inches tall, shattercane is 6 to 12 inches tall, or wild proso millet is 6 to 12 inches tall. For control of volunteer cereals, apply 1 pint per acre before plants are 2 to 6 inches tall. To control wirestem muhly, apply 1½ pint per acre when plants are 4 to 12 inches tall. Fusilade can also control johnsongrass and quackgrass, but sequential applications may be needed. (See the section entitled "Specific weed problems.")

The spray volume should be a minimum of 10 gallons per acre for ground application and 5 gallons per acre for aerial application. Add either crop oil concentrate at 1 percent by volume (1 gallon per 100 gallons of spray) or a nonionic surfactant at 0.25 percent of spray volume. For aerial application, add 1 pint of crop oil concentrate or surfactant per acre. Apply before soybeans bloom. A tank-mix of Fusilade with Reflex or Blazer is labeled for use. *Do not tank-mix Fusilade with other postemergence herbicides intended for control of broadleaf weeds except as specified.*

Whip (fenoxaprop) is used postemergence at 0.8 quart plus 1 quart of crop oil concentrate per acre when giant foxtail is 3 to 6 inches tall or volunteer corn is 10 to 26 inches tall. Use 1.2 pints per acre for 3- to 6-inch tall barnyardgrass or fall panicum. Wirestem muhly (3 to 6 inches tall) or johnsongrass (10 to 16 inches) can be controlled with 1.2 pints per acre. Repeat application may be necessary for control of johnsongrass. Crop oil concentrate is required for the control of wirestem muhly, yellow foxtail, and crabgrass; is optional for the control of shattercane or johnsongrass seedlings; and should not be used for rhizome johnsongrass control. Rainfall within one hour of application may reduce grass control. Whip can be tank-mixed or applied sequentially with Reflex (see Reflex label).

Roundup (glyphosate) can be applied through several types of selective applicators — recirculating sprayers, wipers, or rope-wicks. This application is particularly useful for control of volunteer corn, shattercane, and johnsongrass. Roundup may also suppress hemp dogbane and common milkweed. Weeds should be at least 6 inches taller than the soybeans. Avoid contact with the crop. Equipment should be adjusted so that the lowest spray stream or wiper contact is at least 2 inches above the soybeans. For equipment calibration, refer to the Roundup label. For recirculating sprayers and wipers, use the rates given on the label. For rope-wick applicators, mix 1 gallon of Roundup in 2 gallons of water. A spot treatment with Roundup is also a good option in many fields. For application made on a spray-to-wet basis, use a 1- to 2-percent solution of Roundup in water. For motorized spot treatments in which coverage of weeds may be less than complete, use a 5-percent solution. Avoid contact of the spray with the soybeans. Add a dye for increased visibility.

Soybean harvest aid

Gramoxone Super (paraquat) can be used for drying weeds in soybeans just before harvest. For indeterminate varieties of soybeans (most varieties planted in Illinois), apply when 65 percent of the seed pods have reached a mature brown color or when seed moisture is 30 percent or less. For determinate varieties, apply when at least one-half of the leaves have dropped and the rest of the leaves are turning yellow.

The rate is 11 to 21 ounces of Gramoxone Super per acre. Use the high rate on cocklebur. The total spray volume per acre is 2 to 5 gallons for aerial application and 20 to 40 gallons for ground application. Add 1 quart of nonionic surfactant per 100 gallons of spray. Do not pasture livestock within 15 days of treatment and remove livestock from treated fields at least 30 days before slaughter.

Specific weed problems

Yellow nutsedge

Yellow nutsedge is a perennial sedge with a triangular stem. It reproduces mainly by tubers, which begin sprouting about May 1 in central Illinois. For the most effective control, soil-applied herbicides should be incorporated into the top 2 inches of the soil.

For soybeans, a delay in planting until late May allows time for two or three tillage operations to destroy many nutsedge sprouts. These operations help deplete food reserves in nutsedge tubers. Row cultivation is helpful. Preplant-incorporated applications of Dual, Lasso, or Vernam will also help.

Lasso (alachlor) preplant incorporated at 1½ to 4 quarts per acre can often give good control of nutsedge.

Dual (metolachlor) can be applied at 2 to 3 pints per acre to control nutsedge. Preplant incorporated treatment is preferred to treatment at the preemergence stage.

Vernam 6.7E (vernolate) applied preplant at 3½ pints per acre is effective against yellow nutsedge. Immediate incorporation is necessary with Vernam.

Basagran (bentazon) applied postemergence can also help control nutsedge in soybeans. When nutsedge is 6 to 8 inches tall, ¾ to 1 quart per acre can be applied. If needed, a second application can be made 7 to 10 days later. The addition of 28-percent UAN or a crop oil concentrate improves Basagran performance.

For corn that is planted relatively early, preplant tillage before nutsedge sprouts is of little help in controlling nutsedge. Timely cultivation gives some control, but a program of herbicides plus cultivation has provided the most effective control of nutsedge.

Several preplant treatments are available. **Eradicane Extra** at 5⅓ to 8 pints or **Eradicane, Sutan+**, or **Genate Plus** at 4¾ to 7⅓ pints per acre is effective for control of yellow nutsedge in corn. These products must be incorporated immediately. **Lasso** or **Dual** applied in corn at the same rates as for soybeans can also be quite effective.

The combinations of Lasso, Dual, Sutan+, Genate Plus, Eradicane, or Eradicane Extra incorporated with atrazine may improve control of nutsedge while also controlling broadleaf weeds.

Bladex (cyanazine) or **atrazine** may be used as a postemergence spray to control emerged yellow nutsedge when it is small. Split applications of atrazine plus crop oil concentrate (COC) have been more effective than single applications. **Basagran** may be used in corn in a manner similar to that for soybeans. **Lorox or Linex (linuron)** as a directed postemergence spray has also given some control.

Johnsongrass

Johnsongrass can reproduce both from seeds and by rhizomes. Both chemical and cultural methods are needed to control johnsongrass rhizomes.

Much of the rhizome growth occurs after the johnsongrass head begins to appear. Mowing, grazing, or cultivating to keep the grass less than 12 inches tall can reduce rhizome production significantly.

Control of johnsongrass can also be improved with tillage. Fall plowing and disking bring the rhizomes to the soil surface, where many of them are winter-killed. Disking also cuts the rhizomes into small pieces, making them more susceptible to chemical control.

Johnsongrass rhizomes can be controlled or suppressed with the use of certain herbicides in various cropping programs. Several herbicides can provide control of johnsongrass seedlings in soybeans or corn. (See the table at the end of this guide.)

Treflan (trifluralin) or Prowl (pendimethalin) used in a 3-year soybean program has been fairly successful in controlling rhizome johnsongrass. Either can be used at 1½ to 2 times the normal rate each year for 2 years; in the third year, either they are used at the normal rate or another suitable herbicide is used before a regular cropping sequence is resumed. Thorough preplant tillage and incorporation are necessary for satisfactory control. Be certain not to plant crops such as corn or sorghum the year following application of these herbicides at the higher rates.

Fusilade 2000 (fluazifop) can control 8- to 18-inch tall johnsongrass. Apply 1½ pints per acre before the boot stage of growth. If new shoots or regrowth occur, make a second application of 1 pint per acre when johnsongrass is 6 to 12 inches tall. Add crop oil concentrate at 1 percent of volume or add nonionic surfactant at 0.25-percent volume.

Poast (sethoxydim) can control 15- to 25-inch tall johnsongrass in soybeans. Apply 1½ pints of Poast plus 1 quart of Dash or crop oil concentrate and 1 gallon of 28-0-0 (UAN) or 2½ pounds of ammonium sulfate per acre. A spray volume of 5 to 10 gallons per acre is suggested for best control. If regrowth occurs, apply 1 pint of Poast per acre when johnsongrass is 6 to 12 inches tall.

Whip (fenoxaprop) can control 10- to 25-inch tall johnsongrass in soybeans. Apply 19 fluid ounces of Whip per acre when johnsongrass is 10 to 15 inches tall. Do not apply crop oil concentrate. If regrowth occurs, apply 13 fluid ounces of Whip per acre when johnsongrass is 10 to 15 inches tall.

Eradicane Extra can help control rhizome johnsongrass in corn when used at a rate of 8 pints per acre with a tillage program; or Eradicane 6.7E can be used at 7⅓ pints per acre.

Roundup (glyphosate) can be used as a spot treatment to control johnsongrass in corn, soybeans, or sorghum. Apply a 1-percent solution when johnsongrass has reached the boot to head stage and is actively growing. Use of Roundup in rope-wick applicators or recovery-type sprayers is effective for control of johnsongrass in soybeans.

Roundup may be applied in small grain stubble when johnsongrass is in the early head stage. Fall applications should be made before the first frost. At least 7 days should be allowed after treatment before tillage.

Quackgrass

Quackgrass is a perennial grass with shallow rhizomes. In Illinois, it is found primarily in the northern part.

Atrazine is quite effective when used as a split application in corn. Apply 2 quarts of atrazine 4L per acre in the fall or spring and plow 1 to 3 weeks later. Another 2 quarts per acre should be applied as a preplant or preemergence treatment. Postemergence application is usually less effective. A single treatment with 3 to 4 quarts per acre can be applied either in the spring or fall 1 to 3 weeks before plowing, but the split application usually gives better control of annual weeds. Use equivalent rates of other formulations. If more than 3 pounds of atrazine active ingredient is applied per acre, plant no crops other than corn or sorghum the next year.

Eradicane Extra can be used to suppress quackgrass in corn if more flexibility in cropping sequence is desired. A rate of 5⅓ pints per acre of Eradicane Extra can be used on light infestations, while 8 pints per acre is suggested for heavier infestations. Some risk of injury to corn occurs, especially at the higher rate. A tank-mix with atrazine should improve control. If Eradicane 6.7E is used, the rate range is from 4¾ to 7⅓ pints per acre.

Fusilade 2000 (fluazifop) may be used for quackgrass control in soybeans at 1½ pints per acre. Apply when quackgrass is 6 to 10 inches tall. If regrowth occurs, a second application of 1 pint per acre may be made. Best results are obtained with Fusilade and most other treatments if rhizomes are cut up by preplant tillage to stimulate maximum emergence of grass shoots. Always add crop oil concentrate or nonionic surfactant to Fusilade.

Poast (sethoxydim) may be used in soybeans to control quackgrass that is 6 to 8 inches tall. Use 2½ pints of Poast plus 1 quart of Dash or crop oil concentrate per acre. Always add 28-percent UAN or ammonium sulfate for best control. If regrowth occurs or new plants emerge, apply 1 pint per acre of Poast when the grass is 6 to 8 inches tall.

Roundup (glyphosate) may be used for controlling quackgrass before planting corn, sorghum, or soybeans. Apply 1 to 3 quarts per acre when quackgrass is 8 inches tall and actively growing (fall or spring). For annual cropping systems, apply 1 quart per acre in 5 to 10 gallons of spray with surfactant added. Delay tillage for at least 3 days after application.

Wirestem Muhly

Wirestem muhly is primarily a problem in northern and western Illinois. It is a perennial that reproduces by seeds and scaly rhizomes. The rhizomes are often moved by chisel plows, field cultivators, and shovel cultivators. Many farmers report that delayed seedbed preparation, where possible, can provide some control of wirestem muhly; but wirestem muhly does not start growth until late spring.

Roundup (glyphosate) can be used early preplant (early June) or after harvest when wirestem muhly is at least 8 inches tall and actively growing. Do not till before fall or spring applications. The rate is 1 quart of Roundup in 5 to 10 gallons of water per acre, with surfactant added at 2 to 4 quarts per 100 gallons. Use flat-fan nozzles. After applying, wait 3 days before tilling.

Atrazine at high rates may provide a little help on wirestem muhly in corn. Rates must be at the highest labeled rates for soil. (See the subsection about quackgrass.)

Fusilade (fluazifop) may be used to control wirestem muhly in soybeans. The rate is 1½ pints per acre when wirestem muhly plants are 4 to 12 inches tall.

Poast (sethoxydim) can control 6-inch wirestem muhly in soybeans. Use 1½ pints per acre plus 1 quart of either Dash or crop oil concentrate per acre. The addition of 28-percent UAN or ammonium sulfate will improve control.

Whip (fenoxaprop) can control 3- to 6-inch wirestem muhly in soybeans. Use 1.2 pints plus 1 quart crop oil concentrate per acre.

Canada thistle

Canada thistle is a perennial weed that has a large amount of food reserves in its root system. Canada thistle has several varieties, which differ not only in appearance but also in their susceptibility to herbicides.

2,4-D may give fairly good control of some strains. Rates will depend on where the thistle is growing. For example, higher rates can be used in grass pastures or in noncrop areas than can be used in corn.

Banvel (dicamba) often is a little more effective than 2,4-D and may be used alone or in combination with 2,4-D. Banvel can be used as an after-harvest treatment in wheat, corn, or soybean fields and is labeled for use in fallow fields. Rates vary from 1 to 2 quarts of Banvel alone or in tank-mix combinations with 2,4-D or Roundup. Fall treatments should be applied before killing frosts. For best results, thistles should be fully emerged and actively growing. Fields treated in the fall with Banvel may be planted to corn, sorghum, or wheat the next season.

Atrazine and oil applied postemergence has been fairly effective in controlling Canada thistle in corn. Make the application before thistles are 6 inches tall.

Basagran (bentazon) can be used for control of Canada thistle in soybeans or corn when the thistles are 8 to 12 inches tall. Apply ¾ to 1 quart per acre in a single application; or, for better control, make two applications of ¾ to 1 quart per acre each, 7 to 10 days apart.

Roundup (glyphosate) can be used at 2 to 3 quarts per acre when Canada thistle is at or beyond the early bud stage. Fall treatments must be applied before frost for best results. Allow at least 3 days after application before tillage.

Additional information

Not all available herbicides and herbicide combinations are mentioned in this guide. Some are relatively new and are still being tested. Some are not considered to be well adapted to Illinois or are not used very extensively. For additional information about field crop weed control, consult your county Extension adviser or write to the Department of Agronomy, University of Illinois at Urbana-Champaign, N-305 Turner Hall, 1102 South Goodwin Avenue, Urbana, Illinois 61801.

Table 5. Relative Effectiveness of Herbicides on Major Weeds

This table gives a general comparative rating. Under unfavorable conditions, some herbicides rated good or fair may give erratic or poor results. Under very favorable conditions, control may be better than indicated. Type of soil is also a very important factor to consider when selecting herbicides. Rate of herbicide used also will invluence results. G = good; F = fair or variable, and P = poor.

	Grasses								Broadleaf weeds										
	Crop tolerance	Foxtail	Barnyardgrass	Crabgrass	Fall panicum	Johnsongrass seedlings or Shattercane	Volunteer corn	Yellow nutsedge	Annual morninggglory	Cocklebur	Jimsonweed	Lambsquarters	Nightshade, black	Pigweed	Ragweed, common	Ragweed, giant	Smartweed	Sunflower, wild	Velvetleaf
SOYBEANS																			
Preplant																			
Command	G	G	G-F	G	G	F	F	F	P	P-F	F	G	P	P	F-G	P	G	P	G
Commence	F-G	G	G	G	G	G	F	F	P	P-F	F	G	P	G	F-G	P	G	P	G
Treflan, Sonalan	F-G	G	G	G	G	G	F	P	P-F	P	P	G	P-F	G	P	P	P-F	P	P
Sencor, Lexone + dinitroaniline[2]	F	G	G	G	G	G	F	P	P-F	F-P	F-G	G	P	G	F	F	G	F	F-G
Vernam, Reward	F	G	G	G	G	G	P-F	F	P-F	P	P	F	P	G	P	P	P	P	F
Preplant or preemergence																			
Amiben	F-G	G	F-G	F-G	F-G	F	P	P	P	P	P-F	G	F-G	G	F-G	F	F-G	P	F
Lasso, Dual	G	G	G	G	G	P-F	P	F-G	P	P	P	F	F-G	G	P-F	P	P-F	P	P
Lasso or Dual + Sencor or Lexone[3]	F	G	G	G	G	P	P	F	P	F-P	F-G	G	F-G	G	F	F	G	F	F-G
Lasso or Dual + Lorox,[1] Linex[1]	F	G	G	G	G	P	P	P-F	P	F	F	G	F-G	G	F-G	F	G	F	F
Lorox,[1] Linex[1]	F	F	F	F	F	P	P	P	P	F	F	G	F	G	F-G	F	G	F	F
Lorox Plus	F-G	F	F	F	P	G	P	P	F	G	G	G	F	G	F-G	F-G	G	F-G	F
Surflan,[1] Prowl	F-G	G	G	G	G	G	F	P	P-F	P	P	G	P	G	P	P	P-F	P	P-F
Scepter	G	F-G	F	F	P-F	F	F	F	F	G	F	G	F-G	G	G	F-G	G	G	F
Scepter + Prowl,[4] Treflan, or Sonalan	G	G	G	G	G	G	F	F	F	G	F	G	F-G	G	G	F-G	G	G	F
Scepter + Lasso or Dual	G	G	G	G	G	F	F	F-G	F	G	F	G	G	G	G	F-G	G	G	F
Sencor, Lexone	F	F	F	F	F	P	P	P	P	F-P	F-G	G	P	G	F-G	F	G	F	F-G
Preview	F-G	F	F	F	P	P	P	F	F	G	G	G	F-P	G	F-G	F-G	G	G	F-G
Postemergence																			
Basagran	F-G	P	P	P	P	P	P	F	PF	G	G	F-P	P	P	F	F-G	G	G	F-G
Blazer, Tackle	F	P-F	P	P-F	P	P	P	P	F-G	F	G	F-P	F-G	G	F-G	F	G	F	P-F
Cobra	F	P	P	P	P	P	P	P	F	F-G	G	F-P	F-G	G	F-G	F-G	F-P	F	F
Reflex	G	P-F	P	P	P	P	P	P	F	F	G	F-P	F-G	G	F-G	F	F-G	F	P-F
Classic	F-G	P	P	P	P	P	P	F	F	G	F	P	P	F-G	F	F	G	G	F
2,4-DB	P-F	P	P	P	P	P	P	P	F-G	G	P-F	F	P	F	F	F	P	F	P
Poast, Fusilade, Whip	G	G	G	G	G	G	G	P	P	P	P	P	P	P	P	P	P	P	P
Rescue	F-G	P	P	P	P	P	P	P	F	G	F	F-P	P	F-G	P	G	P	G	P

[1] Do not use for preplant incorporation.
[2] Salute = Sencor + Treflan
[3] Turbo = Sencor + Dual
[4] Squadron = Prowl + Scepter

Table 5. Relative Effectiveness of Herbicides on Major Weeds (continued)

	Grasses							Broadleaf weeds										
	Crop tolerance	Foxtail	Barnyardgrass	Crabgrass	Fall panicum	Johnsongrass seedlings or Shattercane	Yellow nutsedge	Annual morningglory	Cocklebur	Jimsonweed	Lambsquarters	Nightshade, black	Pigweed	Ragweed, common	Ragweed, giant	Smartweed	Sunflower, wild	Velvetleaf
CORN																		
Preplant																		
Butylate, EPTC	F-G	G	G	G	G	F-G	F-G	P	P	P	P-F	F	G	P	P	P	P	F
Butylate, EPTC + atrazine, Bladex	F-G	G	G	G	G	F-G	F-G	F-G	F-G	G	G	G	G	G	F	G	F-G	F-G
Princep + atrazine	G	F-G	F-G	F	F	P-F	P	F-G	F-G	G	G	G	G	G	G	G	G	F
Preplant or preemergence																		
Atrazine	G	F-G	F	P	P	P	F	G	F-G	G	G	G	G	G	G	G	G	F-G
Bladex	F-G	F-G	F-G	F-G	G	P	P	F	F-G	G	G	G	F	G	F-G	G	F-G	F-G
Bladex + atrazine[1]	F-G	F-G	F	F	F-G	P	P	F-G	F-G	G	G	G	G	G	F-G	G	F-G	F-G
Lasso, Dual	F-G	G	G	G	G	P-F	F-G	P	P	P	F	F-G	G	P-F	P	P-F	P	P
Lasso or Dual + atrazine or Bladex	F-G	G	G	G	G	P	F-G	F-G	F	G	G	G	G	G	F	G	F-G	F
Prowl[2] + atrazine[3] or + Bladex	F	G	G	G	G	F	P	F-G	F	G	G	G	G	G	F	G	F-G	F-G
Postemergence																		
Grass or broadleaf																		
Atrazine + oil	F-G	F-G	G	P	P	P	F	G	G	G	G	G	G	G	F-G	G	G	G
Bladex	F-G	G	G	F	F-G	P	F	F	F-G	G	G	G	F	G	F	G	F	F-G
Tandem + atrazine	F-G	G	G	F	P	F	F	G	G	G	G	G	G	G	G	G	G	G
Broadleaf only																		
2,4-D	F	P	P	P	P	P	P	G	G	F	G	F	G	G	G	F-P	G	F-G
Banvel	F-G	P	P	P	P	P	P	G	G	G	G	G	G	G	G	G	G	F
Basagran	G	P	P	P	P	P	F	P-F	G	G	F-P	P	P	F	F	G	G	F-G
Buctril, Brominal	F-G	P	P	P	P	P	P	G	G	G	G	G	F	G	F	G	F-G	F
Laddok	G	P	P	P	P	P	F-G	G	G	G	G	G	G	G	F	G	G	G

[1] Bladex + atrazine premixes = Conquest and Extrazine
[2] Do not use Prowl for preplant incorporation.
[3] Prowl + atrazine premix = Prozine

Prepared by M.D. McGlamery, professor of weed science, Ellery L. Knake, professor of weed science, Dave R. Pike, agronomist, William E. Curran, assistant agronomist, and C. Diane Anderson, Extension assistant, all at the University of Illinois; with the assistance of Rex Liebl, assistant professor of Agronomy at the University of Illinois; George Kapusta, professor of Plant and Soil Science, Southern Illinois University, Carbondale; and Gordon Roskamp, professor of Agriculture, Western Illinois University.

This guide is based in part upon research conducted by Loyd A. Wax, agronomist, USDA, and professor of Weed Science, and by E.W. Stoller, plant physiologist, USDA, and professor of Agronomy, both at the University of Illinois. The assistance of industry representatives is also gratefully acknowledged.

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